JANUARY 16, 1922

AVIATION

VOL. XII. NO. 3

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INDEX TO CONTENTS

Editorials	65	Organization of French Civil Aviation	76
The 14th Aero Club of America Banquet	66	Aviation in Switzerland	76
Soaring Pilot Certificates in Germany	69	Variable Area Wings and Tandem Wings	77
Washington Conference and Aircraft	69	American Airways Mechanics Course	78
Oakland, Iowa, Airdrome	69	Staff of N.A.C.A.	78
Activities of Air Mail Service	69	Fokkers in Spain	78
Could a Sport Plane be Used in Wartime?	70	Admiral Moffett on Civil Aviation	78
Gordon Bennett Balloon Race	71	Pioneer Co. to Handle K-L System	78
Germany and War Planes	71	Sport-Farman at Bolling Field	78
Requirements of Commercial Aircraft	72	On Federal Legislation	79
Helium Investigation	74	Pressure Distribution on Horizontal Tail Surfaces	79
"Who's Who in American Aeronautics"	75	Foreign News	80
		Martin Bombers Make Altitude Flights	80

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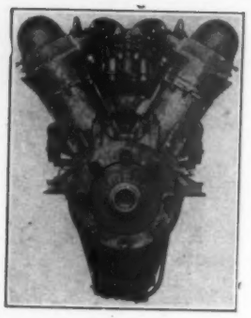
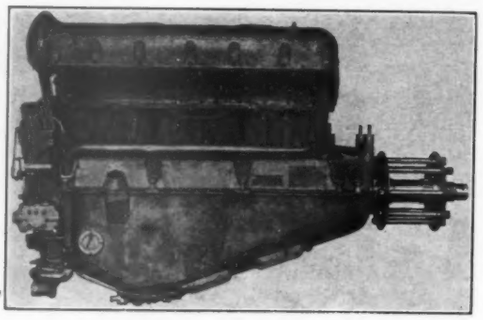
THOMAS-MORSE AIRCRAFT CORPORATION

Thomas-Morse Training 2-Seater in flight over Ithaca, N. Y.

THOMAS-MORSE AIRCRAFT CORPORATION

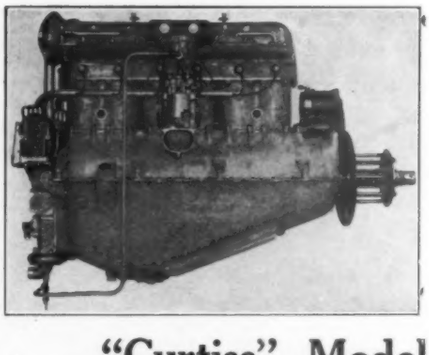
Curtiss

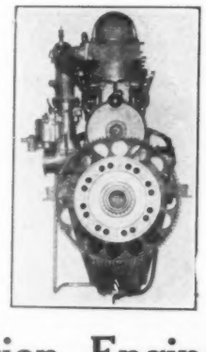




"Curtiss" Model CD-12 Aviation Engine

Number of cylinders	12
Arrangement & angle of cylinders	60° vee
Water or air cooling	Water
Bore	4-1/2 in.
Stroke	6 in.
Brake Horse Power	385
RPM of crankshaft above BHP	2000
Reduction gear ratio	Direct Drive
Gasoline per hour	32.1 gals.
" " BHP hour	.50 lbs.
Oil " " "	.015 "
Weight dry but complete	700 lbs.
" of jacket water	38 "
Piston displacement	1145 cu. in.
Brake M.E.P. per sq. in.	135 lbs.
Compression ratio	5.7:1
INSTALLATION DIMENSIONS:	
Overall length	58-1/8 in.
" height	37-1/2 "
" width	28-1/4 "
Height above engine bed	21-1/2 "
Thickness of " "	1-1/2 "





"Curtiss" Model C-6-A Aviation Engine

Number of cylinders	6
Arrangement & angle of cylinders	Vertical
Water or air cooling	Water
Bore	4-1/2 in.
Stroke	6 in.
Brake Horse Power	160
RPM of crankshaft above BHP	1750
Reduction gear ratio	Direct Drive
Gasoline per hour	13-1/3 gals.
" " BHP hour	.50 lbs.
Oil " " "	.015 "
Weight dry but complete	420 lbs.
" of jacket water	19 "
Piston displacement	572.5 cu. in.
Brake M.E.P. per sq. in.	128 lbs.
Compression ratio	5.2:1
INSTALLATION DIMENSIONS:	
Overall length	57-19/32 in.
" height	40-3/4 "
" width	23-3/32 "
Height above engine bed	24-11/32 "
Thickness of " "	1-1/2 "

CURTISS AEROPLANE & MOTOR CORPORATION

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Vol. XII JANUARY 16, 1922 No. 3

The International Air Convention

AMONG the papers read before the recent aeronautical convention which was held in connection with the Paris Aero Show, one presented by E. P. Flandin, former French air minister, and dealing with aerial legislation, is of particular interest, for it brings out some of the imperfections of the International Air Convention.

M. Flandin points out that when this convention was signed by the Allied and Associated powers, it was generally expected that ratification would promptly follow in the various countries concerned with the application of the convention, so that within a short time the vast majority of civilized nations would recognize and enforce a uniform code of the air. Upon this assumption it was likewise expected that the countries which remained neutral during the recent war would without delay become parties to the convention.

As a matter of fact these expectations have not been borne out by subsequent history. The non-ratification of the convention by the United States and by a large number of Allied powers, on one hand, and the unfriendly attitude toward the convention of most of the "neutral" countries, on the other, have considerably complicated the problem of creating a world-wide code of the air. As a result of this situation, the most important "airfaring" nations were compelled to enter separate agreements with neighboring countries to enable their aircraft to engage in international navigation.

The principal reason for the non-committal or unfriendly attitude of many countries with respect to the convention, according to M. Flandin, is due to Article 5, which bars ex-enemy aircraft from flying over the territory of signatory countries until Jan. 1, 1923, or until the ex-enemy countries are admitted to the League of Nations. This provision is obviously obnoxious to "neutrals"—many of whom are contiguous with Germany—for were they to enforce it Germany would naturally bar their aircraft from flying into Germany.

As a remedy M. Flandin suggests that the International Commission of Air Navigation, for which the convention provides, but which has not yet been appointed, be created without delay, and that its first task be the revision of the convention in the light of practical experience. He proposes among others to eliminate from the convention Article 5, above mentioned, and also the articles (41 and 42) which keep the ex-enemy countries from adhering to the convention so Germany, Austria, etc. could be admitted. In this connection M. Flandin sounds a timely warning in calling attention to the fact that if Germany is not soon admitted to the convention that country will find telling means of retaliation by the first of next year, when the civil air restrictions of the treaty lapse. He makes a strong point in saying that the Allies could not very well *compel* Germany to open her skies at their bidding after having incorporated in the convention the principle of the *sovereignty of each country over its air space.*

Another reason which prompts M. Flandin to urge the appointment of the International Commission is that in accordance with the convention it is this body which is entrusted with working out of the numerous details which are not incorporated in the fundamental text of the convention. Among these questions is that of the airworthiness certificate, for which no common standards exist since the Commission was never appointed, so that at present different requirements apply in France and in Great Britain, for instance.

These views, coming from the man who laid the foundations for France's remarkable expansion in commercial aviation, deserve the greatest attention. For our part, we hope that the warning relative to the chaotic state of international air relations will be heeded, and that we shall soon hail a revised convention which will have the full support of all the parties concerned, including the United States, which signed the convention with some important reservations.

Peculiar Mathematics

ONE of our London contemporaries, in connection with the new British speed record of 196.5 m.p.h. made by the Gloucestershire "Bamel," heads the relative news item "The Fastest Airplane in the World." As the standing world's record, made by Sadi Lecointe on a Nieuport-Delage "sesquiplane" on Sept. 26, 1921, as homologated by the F.A.I. is 205.2 m.p.h. (330.275 km.p.h.), the assertion of our London confrere seems to involve peculiar mathematics.

The apparent reason for this statement is that the "Bamel" made on one lap out of four a speed of 212 m.p.h. Our contemporary seems to forget that the F.A.I. speed record rules provide for four laps (two in each direction) over a kilometer course in order to eliminate as far as possible the assistance of the wind. As in the case of the Bamel the difference between the best and the worst high speed made over the kilometer course was 49 km., or about 30 miles, the need for the precautionary measure recently introduced by the F.A.I. will be better understood. And since the only kind of "maximum speed" the F.A.I. recognizes is one made over a kilometer course, which has to be covered twice in each direction, it is obvious that Lecointe's record does not represent a "flying kilometer" but a four run average.

While we can appreciate the feeling which prompts the boosting of one's own aircraft industry, we do not believe that the latter is served by such a juggling of figures which compares the *best* of four laps made by a British machine with the *average* attained over four laps by the French machine, which incidentally had only 300 hp. as against 450 hp. for the "Bamel." After all, the intelligent reader generally is his own judge of airplane performance, and it does not seem as if witty remarks as to the length of the French kilometers or American miles were likely to swerve his views.

The 14th Aero Club of America Banquet

Collier Trophy is Awarded to G. C. Loening, Mackay Trophy to Lieut. J. A. MacReady -- Admiral Fullam Extols Air Power

Business men and financiers mingled with Army and Navy officers, aircraft manufacturers, designers and pilots, and other people interested in aviation at the fourteenth annual banquet of the Aero Club of America held on the evening of Jan. 9 at the Hotel Commodore. About 250 members of the club and their guests attended the banquet. As a reflection of outstanding aeronautical achievement during the preceding year the dinner was the most successful in the history of the club. Constructive criticism of things as they are was offered by the speakers, civilian, Army and Navy—men who spoke the language of their auditors and knew their individual and collective problems. From an intimate knowledge of present and past developments the speakers were able to visualize the trend of aviation in the immediate future. The composite picture created had elements of great encouragement for an aircraft industry which has mainly been existing on optimism for the past three years.

Nationalization of the Club

From the standpoint of the Aero Club of first importance was the announcement by its president, Benedict Crowell, of the nationalization of the club resulting from an agreement arrived at the same day whereby the club is to amalgamate with the National Air Association. This move, said Mr. Crowell, was in recognition of the broad national aspects of aeronautics and will create a nationwide body with headquarters in Washington and active local organizations in each of the states. The New York headquarters will remain as at present at the clubhouse at 11 East 38th Street. The full story of the nationalization of the Aero Club will be dealt with in a forthcoming issue.

Charles J. Edwards, first vice president of the club, announced the winners for 1921 of the various trophies held in custody by the club and presented Aero Club medals of merit to pilots who had accomplished outstanding achievements during the past year. The Pulitzer trophy was presented to the Curtiss Aeroplane & Motor Corp. for establishing the world's closed circuit speed record of 176 m.p.h. on Nov. 3, 1921, with the Curtiss Navy racer piloted by Bert Acosta, while an Aero Club medal of merit was presented to Acosta. On behalf of the Army Air Service, Lt. John MacReady received the Mackay Army Trophy and the Aero Club medal of merit for establishing the new world's altitude record of 37,800 ft. on Sept. 20, 1921.

For establishing a new world's duration record of 26 hr. 19 min. 35 sec. with the JL6 monoplane, Aero Club medals of merit were presented to Pilots Edward Stinson and Lloyd Bertaud.

Trophy Awards

The Collier Trophy, which is awarded for the year's outstanding accomplishment in aeronautical design, was presented to Grover C. Loening for producing the Loening Model 23 flying yacht which with pilot and three passengers attained a speed of 135 m.p.h. and an altitude of 17,550 ft. Mr. Loening was also awarded the Wright Trophy for the best performance achieved under an Aero Club formula with passengers, between New York and Southampton, L. I., last October. This was stated by Mr. Edwards to represent 100 per cent performance and 100 per cent safety in commercial aviation. This trophy has not yet been completed.

Mr. Edwards stated that the final winner of the Larsen Efficiency Trophy could not yet be announced as the protest made by Mr. Larsen against the award of the contest committee of the Omaha Meet had not yet been acted upon by the special committee of the Aero Club of America. He also mentioned the fact that this trophy like the Wright Trophy, had not yet been completed.

Events to be held during 1922 were then announced. These include the Curtiss Marine Trophy, to be held at Detroit on Sept. 4, immediately after the speed boat contest for the Harmsworth Cup; the Pulitzer Trophy race, to be also held at Detroit, on Sept. 15; and the first annual Interservice Championship Meet, to be held on Sept. 30, probably near New York.

Lack of Army and Navy participation during 1921 in the Pulitzer Race and the foreign speed events was explained by the speaker as due to the pressure of economy at Washington. Mr. Edwards then read in the form of a resolution a petition to the President requesting Army and Navy participation in future contests abroad and in this country. This resolution was seconded by Maj. Gen. Mason T. Patrick and Admiral W. A. Moffett on behalf of the Army and Navy and carried with a loud affiirmative vote. The petition reads:

Petition to the President

Whereas, Believing the following statements to be true, i.e.:

(1) That the development of airplane engineering, whether it takes concrete form or remains on paper, receives its greatest stimulation in times of peace through competition.

(2) That the actual proving and testing of airplanes, motors, and devices in experimental stages can only be accomplished by COMPARISON IN THE AIR, which is competition.

(3) That international competition gives the United States the only opportunity of KNOWING how our new air development compares with that of other countries.

(4) That the popular interest in aviation meets is the keenest stimulation to the personnel of the air service to perfect themselves in their art.

We, the undersigned organizations, and group of individuals, in whom, during the World War, the United States Government vested the development of the air services, airplane production, engineering, research, etc., petition the President of the United States, in times of peace, to heed our advice, and authorize the Army, Navy, Marine Corps, and Post Office Aviation Department to enter, insofar as the departments believe it to be to their advantage, into the following contests sanctioned by the Aero Club of America, in keeping with the above mentioned facts.

EVENTS

(1) Pulitzer Trophy. America's competition for airplanes to develop speed—most essential feature of air travel.

(2) Coupe Henry Deutsch de la Meurthe. The international speed competition to be held in France.

(3) Curtiss Marine Trophy. Competition for seaplanes and flying boats to develop the speed of water machines, greatly needed but grossly neglected, because of the great opportunity of safer air travel over our extensive coastwise and inland waterways, lakes and the Panama Canal.

(4) Commercial Competition. Annual Meet, during which various trophies will be awarded for:

(a) Events in which Government owned planes, adaptable to civil and commercial purposes, may be entered to stimulate development of this type of aircraft by competition.

(b) Events which, by direct comparison in competitive tests, will make available to and bring before the country at large, the knowledge and experience gained by the Government in its use of the aerial mail and other operation of large aircraft; and, at the same time, stimulate the industry to greater progress.

(5) Competition for Personnel of the Air Services. A Championship Meet similiar to the championship tournament of any sport, in which the representatives of the Army, Navy and Marine Corps Air Services previously selected by elimination trials, or other rating, meet to decide the individual and interservice championships for the year.

Suitable trophies will be procured for each event, i. e.: Single Seater Combat, Aerial Gunnery, Bombing, Photography Race, Reconnaissance Race, Formation Flying, etc.

Benedict Crowell then introduced C. F. Kettering as Toastmaster. Mr. Kettering alluded to a remark of Mr. Edwards' that the 400,000 people of Detroit were intensely interested in the forthcoming aviation events in that city. "But," said Kettering, "Edwards did not say which side of the river they are on." This allusion to the attraction of the Canadian side of the Detroit River was greeted by merriment from a very dry assembly. Telegrams of regret from President Harding, The Secretaries of War and Navy, Air Commodore Charleton, Orville Wright, the Postmaster General and Colonel Harold Hartney, and a cable from Brigadier General William A. Mitchell were read by the Toastmaster, who then introduced Rear Admiral W. F. Fullam as the first to engage in solo flights during the evening.

Admiral Fullam then arose and made a speech which was the outstanding one of the evening, being delivered with an energy which carried conviction to the assemblage. He discussed expertly the place of the airplane in naval warfare and in the defense of our coasts. Admiral Fullams's speech follows in part.

Admiral Fullam's Speech at the Aero Club Banquet

Mr. Toastmaster, and gentlemen of the Aero Club of America:

I cannot feel that I deserve the compliment of addressing you tonight. The world is facing a new era, an era which will bring aeronautics to the front and give it a proper place in peace and war.

The Conference in Washington has decreed the scrapping of 66 battleships and a holiday of ten years in battleship building. This momentous decision stops a mad race in enormously expensive ships that are doomed by modern weapons. It saves hundreds of millions, reduces taxation the world over, and lessens the danger of war in the near future.

For these reasons alone every man, woman and child in the world should pray for the ratification of the decrees of this Conference, by all civilized nations To defeat or reject the righteous measures agreed upon by the delegations to this Conference would be a crime far more reprehensible than that of the German Kaiser in 1914. There would be less excuse for such action today than there was for that militaristic spirit that precipitated the World War.

Wars Will not Cease

But it must not be assumed that wars will cease forever. Pacifists must not beguile us into a state of effeminate unpreparedness. In discouraging wars, in comdemning aggression, in abolishing inhuman methods, in protecting neutrals, non-combatants and innocent commerce and in reducing expenditures for out-of-date weapons we must not throw all reason overboard. We must recognize that human nature has not changed. Jealousy, envy and greed still exist among the nations of the earth. We see proof of this in the proceedings of the Conference that has done so many splendid things, in the past two months; we can only postpone war. We can only reduce the number of wars by removing causes that are plainly inviting immediate hostilities.

The Conference Modernizes Naval Thought

One of the most important results of this Conference is to modernize naval thought, and set naval and military minds free from the thralldom of conservatism. Our naval policy was virtually based upon one lone idea—the battleship. The naval brain, during the past eight years has harbored but one thought—battleships. It saw nothing but battleships and battle cruisers, it dreamed only of them. It was tortured with the superstition, with the nightmare of the battleship!

This statement will be considered an exaggeration by certain conservative naval officers. They will claim that our policy included the building of other types of ships, and the encouragement of other weapons like submarines and air forces. But in truth, these weapons were advocated in whispers, while the need of battleships was sounded by a megaphone. Money was poured out for capital ships, but it was vouchsafed in miserly pittances for the new weapons that are essential in modern war. I know this from personal experience. A statement to the Senate advocating a fleet of 21 dreadnoughts and the suspension of the 1916 program beyond that, in order to provide money for submarines, airplane carriers, and airplanes was received with impatience and hostile action!

"Battleshipitis"

The feeble statement by Congressmen and others that the principle of a three-plane-navy recognized by the advocates of the 1916 program resulted in no action to support this intelligent declaration. There were hundreds of millions for capital ships and comparatively nothing for the forces in the upper and lower planes—for air forces and submarines.

But the Conference has provided a tonic that may cure this awful disease of "battleshipitis". If we are to build no more of them for ten years, naval officers may turn their minds to the development of something else. The one idea which completely filled their brains may now be permitted to hybernate so that two or three other ideas may find birth and nourishment. There is hope.

And it must be recognized that this naval malady, "Battleshipitis" was not restricted to the United States. This naval plague was found everywhere. It raged in England and Japan and other nations were saved from it only because they could not raise the billions necessary to create battleship fleets. It threatened to bankrupt the world.

Conservatism in the Navy

The craze for battleships in 1922 was born of conservatism. In a recent lecture at the Naval War College, Admiral Sims demonstrated that conservatism has always kept military minds in a rut from the days of Noah. Let me briefly review our own Naval history. In 1862 the Monitor and the Merrimac proved that wooden ships were useless against armored ships in war. Had the Merrimac beaten the Monitor she would have raised the blockade and won the war for the South. Farragut, with his wooden ships, triumphed simply because the South had no navy.

Following the Civil War, we profited little by its naval lessons. We had virtually developed the all-big-gun ship, the dreadnought of today. The Monitor contained all the germs. The double-turretted monitors, Miantonomah, Monadnock, Puritan and Terror were low-free-board dreadnoughts. The Monadnock rounded Cape Horn, the Miantonomah cruised to Europe. This proved that the Monitor was a sea-going fighter. It was the most powerful ship afloat.

Foreign Nations Outstripped the United States

But we stopped, while other nations progressed. We returned to antique wooden ships, while European nations built iron and steel ships and developed the modern battleship. I cruised in the Mediterranean from 1877 to 1879 in wooden ships, the Marion and Trenton. It was humiliating. In every port we found armored ships of Italy, Austria, France and England. Italy had the Dandolo and Duilio with their hundred-ton guns. The Stars and Stripes were carried by wooden arks with 9-inch smooth bores or converted rifles!

And so it happened that until we built the grand old Oregon, the Massachusetts and the Indiana—more than thirty years after the Monitor and the Merrimac—we were sleeping in the arms of Conservatism, building wooden ships and sailing vessels, while foreign nations were designing fleets of modern battleships, any one of which could have sunk our entire navy!

The Conference Sets us Free

Now, gentlemen, is it not plain that the same conservatism that stifled progress in our Navy for thirty years following the Monitor and the Merrimac might have continued to hold naval officers and Naval Committees in double irons had not this Conference stopped the mad battleship mania and struck the shackles from enslaved naval minds! How long would we have waited for a recognititon of modern weapons with naval brains so hidden behind the armor of our Dreadnoughts that the light of a new era could not penetrate! But the Conference has decreed a scrapping carnival, and a ten year battleship holiday. Naval intelligence may now come from behind armor and assert itself. It may get on the road to progress and provide us with a modern navy—a three-plane-Navy. It may distribute the appropriations wisely on the three planes, and it may develop a type of surface vessel which will be less expensive, less vulnerable and more useful than the $45,000,000 dreadnought of today. We must have a surface Navy. There can be no Navy without ships. There will always be fighting ships upon the sea, it is a question of types—that is all.

Conservatism Has Virtues

Conservatism at the Navy Department has often served a good purpose. There is reason in all things. If the Navy Department had accepted every innovation, every invention, and had changed its building policy to accord with the views of every invention, and every theory advanced and urged during the past fifty years, there would have been no money left in the United States.

And so, we must always be conservative within limits. We must distinguish between things that have been proved and things that are unproved. We must never claim too much for a new invention or a new weapon. In doing so, in overstating our case, we weaken our position, and reflect upon the soundness of our judgment. In promoting aviation in the Navy, for instance, we must not claim that all surface ships and all dreadnoughts must be immediately scrapped. We must keep what we have until we get something better. We can not jump overboard off our battle fleet and swim around in the Atlantic and Pacific Ocean with nothing to land upon!

The Conference at Washington has intelligently recognized this fact. We are still to have eighteen battleships, and hundreds of destroyers, cruisers, submarines and plane carriers. We are still to have the strongest surface Navy in our history. But it is wisely decreed that we will build no more battleships for ten years. During that interval we can develop new types. We can give to other weapons their proper place and their relative value in a Three-Plane-Navy. This is a gist of the whole subject. This is not a one idea Navy. This is not a weak Navy; it is a strong Navy. It is a modern Navy, the kind of a Navy that every loyal American citizen should support.

The Future

So much for the past. Now for the future. We know Naval history up to date. We must now anticipate the conditions of the years to come. Aviation is no longer a theory, it is a living condition. The airplane is no longer an untried, untrustworthy, unsafe, unproved flying machine! It is a tried, trustworthy, safe and invaluable means of travel. It is now a commercial necessity. It will become more necessary and more valuable every day from this time on.

But it is not my place to speak of the commercial value of aviation. It is the duty of every naval officer to study and develop the usefulness of the airplane as a weapon. In this we must lead the world, we must not follow.

We must be in front; not behind. Our Navy must be up-to-date, not archaic.

The Bombing Tests

Recent tests have proved, beyond question, that the airplane will be the dominating factor in future wars on land and sea. Airplanes discovered the Iowa within a sea area of 20,000 sq. mi. in less than three hours.

As a scout, the airplane is supreme. Airplanes sank the German ships—a battleship, a cruiser, a destroyer and a submarine with ease. The Joint Board reported that bombs alone could sink any ship that can be designed. The percentage of hits in all these tests was high, remarkably high, when we consider the crude sights and the limited experience in bombing.

Conservatism now seeks to underestimate and belittle these tests. This attitude is as unfortunate and unwise as it is futile. It is claimed that the planes had an advantage in the attack because the targets were anchored and could not fight back. On the contrary, it may be claimed that they would have been sunk or disabled much sooner had the ships been under way with engines and boilers in operation, magazines filled, ammunition, torpedoes, and depth charges around the decks, and steering gear vulnerable to attack. General Mitchell's claim that under such circumstances, and with freedom to attack in force and with weapons of his choice he could have sunk or disabled the whole squadron in fifteen minutes is perfectly reasonable. I witnessed these tests and I believe Mitchell's claim is justifiable. Moreover, I believe that a foreign fleet that does not command the air above itself constantly night and day will be destroyed, disabled or driven off, if it comes within one hundred miles of our coast, provided the United States supplies itself with a strong air force.

Anti-Aircraft Guns

The defense of a fleet by anti-aircraft guns is not possible. The masts, smoke pipes, bridges, radio and other obstructions so interfere with these guns that their field of fire is very small. Moreover, they are inaccurate at best. This is especially the case with small ships, rolling and pitching at sea. I am reminded of a story told by Admiral Sims.

Two men were out shooting. One of them stuttered and the other had Saint Vitus' dance. One could talk with difficulty, but his nerves were steady. The other could talk perfectly, but every muscle in his anatomy twitched constantly. The man who stuttered saw a bird, took deliberate and deadly aim, fired and missed. The man with Saint Vitus' dance, quickly threw up his gun, the muzzle wabbling all around in circles, fired and brought down the bird. His friend exclaimed: "W-well; n-no wonder you h-hit him! You a-aimed *everywhere!*" Here we find the only hope of the anti-aircraft guns. If they are manned by sailors with Saint Vitus' dance, heaven help the airmen!

The Night Attack

Now, consider a night attack on a fleet, or ship, by airplanes. The experiment with the Alabama was illuminating. The attacking planes flew 50 miles, located the Alabama among many ships and bombed her successfully. They were virtually inviaible. With their exhaust pipes muffled, we did not hear them. They could have attacked at a very low altitude—near the tops of the masts—if necessary. Against such an attack, a ship is powerless. What could a fleet do if at anchor, or under way, to protect itself from a determined attack by air forces at night! Will somebody answer this question! And suppose the planes use mines and torpedoes besides bombs! In truth, it is appalling to stop and calmly consider the danger to which a fleet at anchor or under way may be subjected by the attack of a well organized, well armed, and well drilled air force, especially at night.

Personally, I do not believe that any fleet can successfully operate against such forces, or can survive such attacks. After an experience of more than forty years in training the officers, midshipmen and the enlisted men of the Navy, noting their intelligence, their fearlessness, their devotion to

the traditions of the Navy and their loyalty to country, and after viewing the dauntless spirit and skill of General Mitchell and the First Provisional Air Brigade at Langley Field, I am convinced that no foreign fleet will dare to come within two hundred miles of our shores, if we give these lads the proper weapons and the opportunity to use them. Air forces alone can protect a coast against hostile attack from overseas.

Armies Cannot Cross the Sea

It is amazing that writers, and so-called experts—even Army and Navy officers— continue to talk about sending Armies and fleets to invade or to attack a naval power across the oceans! Can it be done, if that enemy, or the defensive, commands the air? Is such a thing possible? It would appear to be an insane proposition. I wish every man here tonight would read an article by Vice-Admiral Mark Kerr of the British Navy in the *Nineteenth Century Magazine* for last September. There are American Admirals who fully agree with Admiral Kerr. But they have not felt at liberty to publicly express their opinions on this subject. I believe, however, that they may be encouraged and that they may be permitted to do so if the proceedings of the Washington Conference are ratified by the Senate and the people of the United States. Aviation will soon have an inning.

Gentlemen, air forces will discourage or prevent war over-seas. The airplane is a God-send! It will localize war. It will limit wars to the continents. Inter-continental wars will be impossible, or very infrequent hereafter. Armies cannot again cross the oceans in the face of submarines and air forces. There will be naval wars, but they will be limited. Fleets cannot attack a coast in the future. Air forces will promote the freedom of the sea and protect weak nations.

Bad Weather

Conservatism claims that the airplane, the airplane carrier, and air forces generally will be rendered ineffective by bad weather, fogs, gales, etc. But all naval operations are similarly affected. It is absurb to attempt to discount the airplane by this argument. Airplanes have flown from London to Australia, from New York to Alaska, from San Diego to Panama, across the Atlantic and only the other day Stinson and Bertaud remained 27 hr. in the air in mid-winter during snow storms, and in a gale of wind. Can a hostile fleet safely approach our shores defying men who do such things in the air? And we must remember that the weather is not always bad. Even admitting that an air force could not always attack in bad weather would a fleet cross the ocean to attack us, or would we send a fleet to attack overseas with bad weather as our only hope?

Perhaps Army and Naval officers would be less prejudiced against the airplane if they could be induced to regard it as a gun and not as a flying machine. And in truth it is a gun—the most powerful and effective gun, with the greatest range, the heaviest projectiles, the greatest variety of offensive and explosive agents known in history. It can carry 4,000 lb. of bombs, large or small, torpedoes, and mines and attack an enemy hundreds of miles distant. Other guns are tied to the beach or to the ship. The airplane gun can move to a base anywhere along the coast. All the planes in the United States can be mobilized against an enemy in a few hours.

Forts vs. Airplanes

We have considered the helplessness of ships against air attack. How about forts? Can the forts on our coast, with their 16-in. guns, successfully resist the attack of the 2,000-lb or 4,000-lb. bombs? Are they safe at night? Picture such an attack! And compare the usefulness of the guns of a fort, with the airplane against a hostile fleet, especially at night! The guns of forts and ships are comparatively useless at night. But it is at night that the air force will get in its deadly work—at night—in comparative safety. It would appear that air forces will be trained and will be used principally to attack at night. If so, it is difficult to see how they can be repelled.

Limitations of Airplanes

It would be unfair not to note certain limitations of the airplane as a weapon. Although it carries the heaviest projectiles, and the greatest variety of projectiles, it must return to base or to the carrier after it fires its supply of shells, torpedoes, or mines—be it one or more. It must have landing fields and bases on shore and it must land on the carrier or in the water alongside, and be hoisted on board before it can renew the attack.

The problem of air forces operating from the shore is simpler than in operating from the ship. It is for this reason that navies and battleships cannot be scrapped. The airplane carrier bids fair to become the capital ship of the future, but it is not yet fully developed. We can safely predict, however, that an all-metal plane will be developed that can be handled and hoisted at sea as safely as a life-boat. A navy seaplane was navigated 250 miles in a gale by Commander Towers and reached the Azores in safety.

Viewing the airplane as a gun, it can be used by merchant steamers to protect themselves from attack at sea, provided the arming of merchant ships is not to be forbidden by international agreement. The navy has developed a catapult which projects the airplane from a ship's deck and starts it in its flight. With this device all ships in the Navy, and all merchant ships in time of war could be equipped to fight their own battles and protect themselves from enemy cruisers.

Conclusions

The more we study this subject more clearly we see that Army and Navy must wake up and adjust their ideas to the inevitable. The money available for the military and naval services must be expended on modern lines to give the best results in offensive and defensive warfare. Forts and battleships must not demand the lion's share. The weapons that can destroy or sink them must take precedence. The victor, not the vanquished, must be rewarded.

A review of this subject justifies the following conclusions:

1. Fleets and forts cannot resist air forces.
2. Armies cannot be sent overseas.
3. A fleet that does not command the air above itself cannot leave the home coast.
4. Aggressive war overseas will be difficult if not impossible.
5. Airplanes can attack ships with bombs and torpedoes, and can fence a fleet with a barage of mines.
6. A fleet may be completely at the mercy of an air force attacking at night.
7. The airplane is a flying gun of great offensive power—greater than any other gun.
8. Inasmuch as airplanes can sink submarines, and surface ships, or threaten them with a variety of weapons by day and by night with little danger from anti-aircraft guns it would appear inevitable that Sea Power will hereafter be dominated by, or be dependent upon, Air Power.
9. The next war, on land or sea, will be won by the nation that commands the air.

When General Patrick took the platform it was his introduction to the majority of those present. His extemporaneous speech made a splendid impression as did his knowledge of Air Service and commercial aviation problems and his suggestions for their solution. He pointed out the necessity for a going American aircraft industry to provide manufacturing facilities for rapid expansion in case of war as well as a reserve in trained pilots on which to draw. In the present stage of the country's finances no large naval and military air service could be maintained. The immediately essential needs of aviation were stated by General Patrick to be: 1. legislation that will warrant the ability of the men who fly and the reliability of the machines which they operate. 2. A proper system of government controlled airways and airdromes with facilities for repairs and maintenance of machines. 3. Meteorological forecasts adequately disseminated He praised the activities of the Aero Club and stated that the new national organization if properly conducted could achieve wonderful things for the promotion of aeronautics. A point of particular interest to those considering commercial air operations was General Patrick's statement that certain air routes had already been mapped out by the Air Service and that arrangements with Chambers of Commerce in principal cities for the erection of airdromes had in several cases been made. The Air Service wishes to go as far as they possibly can in cooperating and helping the development of civil aviation. He would go as far as the Secretary of War in saying that something must be done, indirectly if possible or directly if necessary, in the way of government aid as in other countries. General Mitchell came in for strong praise by General Patrick for his tireless work for the Army Air Service, and particularly for the effective organization and training of the pilots who successfully bombed the ex-German battleships.

Admiral Moffett followed General Patrick. In the main he appeared to agree with the remarks of Admiral Fullam as to the position of aviation in future warfare but he pointed out that the Navy considered the aviation problem as one of offense; that in war the Navy would not wait for a foreign fleet to approach our coasts. The necessity for ship planes and aircraft carriers was emphasized. The Navy also was in accord with the Army policy of encouraging the development of civil aviation. Admiral Moffett considered the outstanding development in Naval Aviation during the preceding period was the naval catapult capable of launching a 2,000 lb. plane. The Navy, he said, were developing another which would launch any plane. These devices would enable the Navy to put their planes on every battleship, cruiser and destroyer. Submarines also in future would carry airplanes. The capital ship of the future, Admiral Moffett said, would carry aircraft instead of guns. He referred to the five carriers aggregating 80,000 tons which had been allowed the U. S. Navy by the Washington Conference and he paid a high tribute to General Mitchell for having through his daring and knowledge made possible the demonstration of air power which the bombing tests off the Virginia Capes afforded. Admiral Moffett reviewed the notable long distance flights made by the Navy during the preceding year and pointed out that the Navy now has the largest and most complete airship hangar in the world at Lakehurst. He predicted that in another year rigid airships would be making regular flights between New York and San Francisco, at least in the transportation of naval officers. This development has been made possible by the perfection of mooring masts and helium gas.

The Wadsworth-Hicks Bill

Representative F. C. Hicks, who sponsored in the House the present air legislation which Senator Wadsworth is advocating in the Senate, known as the Wadsworth-Hicks Bill, explained the provisions of this proposed legislation and the necessity for it from the legal and operating standpoints. Mr. Hicks urged all present to actively support the Hicks-Wadsworth Bill by writing to their representatives and Senators. He predicted the early passage of the bill if everyone concerned would give it support. Mr. Hicks stated that it is now before the Interstate and Foreign Commerce Com-

mittee, and that it should come up before the Senate and House within three weeks. He urged the newspaper men present to soft pedal on aviation accidents and to place more emphasis on the actual achievements in aviation.

Mr. Kettering followed, pointing out that 1891 persons were killed by automobiles in New York City last year, while 80 people in Missouri were kicked to death by mules, neither of which items had been considered of much interest by the newspapers, compared to the few aviation accidents.

Captain Rickenbacker's Speech

Eddie Rickenbacker was then introduced by the Toastmaster, who stated that he would deliver an impromptu address which had already been released to the newspapers. He said in part, regarding the problems confronting the development of civil aviation:

First of all, we must bear continually in mind that in dealing with civil aviation we also are dealing with our aeronautical reserve, the great third arm of our national defense. They are one and the same thing, civil aviation and national defense. We must maintain that organization with every means at our command. For it is the civilian aviation industry which will provide our aircraft and develop and perfect it. We must maintain it not only for civilian purposes but for military emergencies.

We could do nothing in war without it. We would be far behind an enemy did we not possess an aircraft building industry capable of producing machines in performance and quanity the equal of any other nation. I say any other nation in all sincerity, because once at war we would find that our enemy would go into every market of the world for the best in planes and equipment.

We need an aircraft industry second to none. If we don't have it we are passing up our chief insurance against war and our chief protection if war should come. And, mind you, that great important truth throws the aircraft industry directly into the arms of the government. By that I do not mean to suggest or bid for subsidies; though it is a well known fact that every nation on earth is subsidizing its aircraft industry.

Our Government must take cognizance of the need for this industry. It must support it, legitimately in every conceivable way; and I am strongly of the opinion that there are two principal methods for the government to act in this matter; and *ACT NOW!*

(1). By adopting a policy which will take aircraft construction out of the arsenals. Remove the construction of aircraft from government owned and government operated factories and place that work where it will serve to maintain a reserve industry, helping to nourish it until by the increased use of civilian machines, our plants and factories, and our engineering establishments shall become self-supporting. It will be cheaper in the long run, and without added cost to the government at present or in the future. The civilian aircraft builder can produce government planes, designs, and engineering facilities and equipment as reasonably, in fact, more economically than the government. And that is the truth, borne out by figures which are available to every person who cares to investigate the truth of the statement.

(2). Then also, the Government must provide us with aerial law. Today aviation is technically an outlaw institution. We have no laws to protect it or control it. One can fly anything, anywhere, with nothing but his own judgment to guide him. The reckless pilot, the fool stunt flier, the conscienceless promoter of fake aerial enterprises—these people can claim to do anything that the best of us can do in the air—and get away with it. The man of conscience and desiring to abide by the law, protecting himself, his passengers and the property and persons of others on the ground, finds himself up against it because he has no laws to guide him, and no law to protect him.In view of this I call your attention to the Wadsworth-Hicks Bill, now before Committees of both Houses in Congress. This bill should be passed immediately, as it embodies most comprehensible plans for eliminating many of the problems with which aviation is confronted.

A feature of the evening was the showing of moving pictures of British experiments in landing airplanes equipped with skids on a floating platform as well as the trials of the H.M.S. Argus and the landing and taking off of ship planes with conventional landing gear.

Captain St. Clair Street followed with a brief talk on the organization of the air brigade which bombed the ex-German battleships and the Alabama off the Virginia Capes, and showed the bombing pictures of the bombing of all the ships. From the way these pictures were received the audience showed to be thoroughly impressed with the dominant position aircraft have attained in matters of national defense.

Soaring Pilot Certificates in Germany

An indication of the development of motorless flight in Germany is furnished by the news that the Union of German Model and Gliding Flight Association is now issuing certificates to soaring pilots.

Candidates have to furnish proof of having made a soaring flight of not less than 1000 ft. length or 30 sec. duration, or several flights of at least 500 ft. length or 15 sec. duration aggregating 1300 ft. in distance of 40 sec. in duration.

The first certificate was delivered to W. Klemperer, pilot of the Aachen soaring machine. By Oct. 1, 1921 eighteen certificates had altogether been delivered.

The Washington Conference and Aircraft

The Washington Conference on the Limitation of Armaments on Dec. 30, 1921, unanimously agreed to the proposed limitation of tonnage of naval aircraft carriers. The ratio of 5 5-3-2-2 was adopted for the five powers concerned, with a tonnage limitation of 135,000 tons each for the United States and the British Empire, 81,000 tons for Japan, and 60,000 tons each for France and Italy, and a maximum tonnage per aircraft carrier of 27,000 tons.

The original Hughes proposal fixed an allowance of 80,000 tons each for Great Britain and the United States and 48,000 tons for Japan. It was pointed out that under the proposal that no airplane carrier should exceed 27,000 tons, this scheme would give France and Italy with a tonnage on the 1.75 ratio only one ship.

There was a general agreement that the original figures were low. The Japanese said they wanted three airplane carriers. Great Britain wanted five. At a maximum tonnage of 27,000 tons to a ship, this would mean 135,000 tons for England and 81,000 tons for Japan. The French said they would like three, but thought a tonnage of 60,000 would be enough, inasmuch as smaller ships than 27,000 tons would probably do. Therefore, the tonnage of airplane carriers was fixed as above stated, which almost preserved the ratio of 5-5-3-1.75-1.75 fixed for capital ships.

The committee of experts named by the Washington conference to prepare a report on ways and means of controlling war aircraft has completed its report. According to the New York *Times* the following is a summary of the conclusions embodied in this report, which is divided into three parts in accordance with the number of tasks assigned the committee.

1. Usage. It is not feasible for a conference of five powers to lay down rules for the war use of aircraft, since all nations may have aircraft. Therefore this matter may best be considered at a meeting of wider scope.

2. Numbers. In view of the essential similarity between civil aircraft and military aircraft, and the ease with which one may be converted into the other, and in view of the impossibility of limiting the number of civil aircraft that any nation may have, the committee is unable to make any recommendations as to the number of aircraft which a nation may have military use.

3. Form. It is evident that a freight carrying airplane may be easily converted into a bomb-carrying airplane; it is probable that any limit placed upon the development of fighting airplanes would be ineffective because the sporting and racing airplane of peacetime is developed along the lines of war airplanes. Therefore the committee has no concrete proposals as to the control of the form of airplanes.

Oakland, Iowa, Airdrome

The Oakland Aero Club of Oakland, Iowa, notifies that all pilots are welcome at its airdrome, 3 miles southwest of Oakland, Iowa (on the Chicago-Omaha Air Mail Route). The field is marked by a large white cross, 30 x 24 ft., located in the best section of the airdrome which contains 60 acres.

Good approach is from all points, with no obstructions excepting the "sock" (wind cone) which is mounted on a 30 ft. steel tower at the southern boundary of field. High test gasoline, oil and repairing are available. If no one is on field, call phone number 96 on marker. Oran Brown is general manager, and Wilbur Nilan field superintendent of the Aero Club of Oakland, Iowa.

To Increase Activities of Aerial Mail Service

Glenn L. Martin, the airplane manufacturer of Cleveland, Ohio, and Assistant Postmaster Shaughnessey are expected at Crissy Field, Presidio of San Francisco, Calif., in the near future for a conference with Maj. H. H. Arnold, 9th Corps Area Air Officer, and other army officials. Much is looked for as a result of their conference in furthering the activities of the Aerial Mail Service and as a stimulant to the number of civilian flyers in the Bay region of San Francisco.

Could a Sport Plane be Used in Wartime?

Large Fleet of Sport Airplanes Armed with Machine Guns May Prove Valuable Auxiliary for "Ground Strafing"

By Lt. Col. H. E. Hartney

The "Messenger"—a high performance single-seater powered with the 60 hp. Lawrance engine—designed by McCook Field, and built by the L. Sperry Aircraft Co.

Whether it is because we know so little about airplanes generally and their adaptability to war purposes or whether it is a case of "there is none so blind as he who will not see" it is a fact that the potentialities of an airplane in war have been neglected in the discussions at the Limitation of Armament Conference.

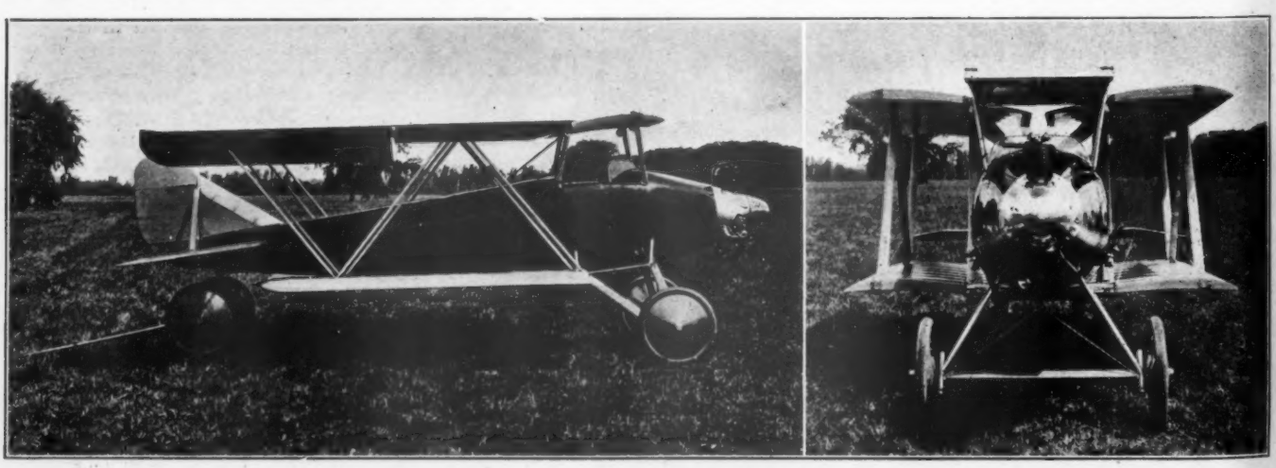
It is pretty well conceded by everyone that any commercial plane can be converted over night into a powerful military machine but few have ever considered the possibility of converting sport planes of the type of the "Messenger," the "Farman Sport" "the Longren," or the "Curtiss Mummert." It is the purpose of this short article to discuss briefly the possibilities of using sport airplanes for war purposes and, as in every similar consideration, it is well to consider both the technical and the tactical aspects of the problem, we shall proceed to examine the possibilities from these two main viewpoints.

Suppose that we could produce a sport plane for the same amount of money that it is claimed Henry Ford produces his chassis—$97 and there seems no reason why any plane of the Farman type could not be produced as cheaply as a Ford Car—for is it not true there is no transmission, no heavy running gear to eat up the cost of production.

A Brigade of Flying Soldiers

The Air Service of the Army at the present time has possibly 6,000 machine guns on hand. Is it not conceivable that we could arm 6,000 soldiers with an airplane equipped with one machine gun instead of arming each man with a rifle? Most sport planes can carry a passenger. That means that they can take care of the extra weight for ammunition, synchronizing gears and machine gun.

The technical consideration seems to be quite favorable and one cannot but admit that from this standpoint, at least, it is conceivable that sport planes could be equipped for war purposes. But if their ceiling is so limited, if their speed is so low and the rate of climb and their maneuverability so poor that they cannot live against modern fast pursuit planes, would the game be worth the candle in sending them into battle? It is the opinion of the writer that, provided the functions of the plane were limited to one of low flying, at certain specific intervals swarms of these planes (for they would only go out in swarms) could do a very great deal of damage.



Two views of the Longren two-seater (60 hp. Lawrance) with wings folded, which was one of the revelations of the Kansas City and Omaha meets

Last year at McCook Field an officer of the Air Service in a "Messenger" kept circling as he combated a modern pursuit Fokker type plane in such a short radius that the heavy war time product of Germany was unable to train its guns on the smaller and more agile Sperry product and, with perfect impunity, kept out of the field of fire of his adversary so long as he kept at low altitude. The Fokker, of course, was able to zoom in recline on the "Messenger" but this availed him little when the pilot of the latter availed himself of its wonderful maneuverability.

Simplifying the Problem of Maintenance

Maintenance is always one of the big factors in war planes. Imagine the equipment of a squadron of sport airplanes as opposed to a modern American Air Service squadron consisting of 150 odd mechanics, 25 officers and 25 planes; one would find probably 125 planes, 125 pilots and 25 armorers as well as 25 duty men. Formations would go out consisting of sixty planes instead of eighteen or twenty. They would not require hangars when they returned for the night and, indeed, it is just possible that the personnel would sleep in the plane or underneath its wing. Truly, each man would be armed with an airplane. The re-fueling problem would not be so great as it first might appear probable for the small engine of the "sport" plane requires such a small percentage of the modern war ships.

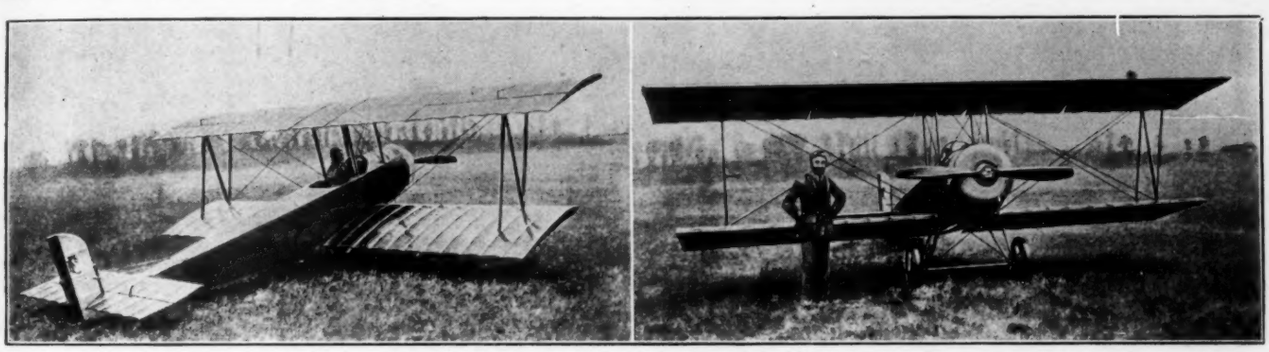
Consider the advantage of a squadron being able to land just behind the front line for alert purposes, instead of returning to a base airdrome as is now necessary with the bigger type of plane that rolls so far on alighting.

The Mummert sport airplane (28 hp. Lawrance)—one of the smallest "ships" in existence

on the dead space of a hill right up at the very front line and from there operate in an infantry attack problem the following morning.

Sport Airplanes for Night Flying

Few observations have been made of the advantages of the sport plane for day flying. At night time it could be used to great advantage for many purposes, such as low strafing or precision bombing. Nightly, in good or bad weather, pilots would gladly fly over at extremely low altitude in a plane in which they knew it would be impossible to be hurt badly,



Two views of the Sport-Farman (60 hp. LeRhône)—a remarkably efficient two-seater with unusually low landing speed—the "ship" can be stunted, but not spun

During the world war Capt. J. Vasconcelles of the 27th Aero Squadron made use of an old dis-used hangar at Verdun and practically on the front line operated from a base inside an old hangar. He literally took off from inside the hangar, but gained so much by being close up that the suffering he later endured from the shower of shells the enemy sent over was more than compensated for. With the sport plane in use one could imagine many similar instances. It is just possible that some sergeant would take twenty planes and in the dusk of evening or in the very early morning, alight

The de Pischoff "Avionette" (20 hp. A.B.C. "Gnat") single-seater, sport airplane, which embodies special features insuring quick take-down and assembly

even in the event of a forced night landing. On the other hand, the constant harrassment by night would wear down even troops of the highest morale in the enemy lines of communication.

It is prophesied that by this time next year in the United States alone there will be, at least, 3,000 operating sport airplanes. Consideration, therefore, should be given to the possibility of using this fleet in the event of war for just such purposes as those above mentioned. By 1926 it is just possible that every man in twenty-five will own a sport plane. What a potential military reserve this would be should the sport plane be tactically used in the manner above-mentioned, can be readily imagined.

Gordon Bennett Balloon Race

It has been decided by the Aero Club of Geneva that the 1922 Gordon Bennett Balloon Race is to be held on Sept. 2, 1922, and start from Geneva. Zurich in this connection proposes to organize an aviation meeting.

Germany and War Planes

From Berlin the figures given for German military aircraft destroyed, etc., up to Oct. 1, 1921, are 127,471 airplanes and 20,364 aero engines destroyed, and 629 airplanes and 3,632 aero engines surrendered.

Requirements for Commercial Aircraft *

An Airplane Which Can be Operated on a Ton-Mile Cost Basis--Efficient Design and Inexpensive Maintenance

By W. B. Stout

Stout Engineering Laboratories, Inc.

Flying is an accomplished engineering fact:—a laboratory transportation experiment, soon to become a commercial profit-paying fact as well. The future of commercial flying, however, first depends upon the production of an airplane which can be operated on a ton-mile cost basis, which makes it a commercial proposition.

The European Air Lines

As is generally known, there are many lines operating at present in Europe successfully, but all of these lines are subsidized by the governments. They are using airplanes which, in the air show a very good ton-mile cost, but which, from the standpoint of upkeep, replacement, etc., still leave much to be desired, largely on account of the material used in the construction and the amateurish arrangement of structural members.

In a motor car, production cost has been a primary item considered, and it is naturally an important item as connected with airplanes, but when one remembers that the mere rounding off of the corners of a square block may decrease its resistance over 30 per cent, one sees especially the importance in an airplane of spending money in structure for the elimination of aerodynamic disadvantage. The difference in ton-miles per gallon between a square fuselage and a round one in a year's operation might mean a difference in operative capacity of several times the cost of the plane.

It must be remembered, too, that European air lines are over comparatively short routes, with landing fields at very close intervals. American routes must of necessity be over greater distances and in competition ordinarily with excellent railway facilities. This means that the American commercial airplane must have a higher cruising speed than the European machine for the same service. It is necessary, if 90 m.p.h. maximum is sufficient for Europe, that we have at least 120 m.p.h. maximum and 100 m.p.h. cruising speed. This necessitates excellent streamlining, better efficiency wings, and greater thought expended in constructional and aerodynamic details.

Commercial Considerations

As a matter of beginning, I have tabulated airplanes now being built abroad for commercial operation, but this table naturally does not show the kind of a landing field which any one of these planes requires, through the length of its take-off or the long run of its landing. It does not show how quickly engine installations may be replaced or accessories got at for adjustments and repairs. It does not illustrate the comparative amount of structural adjustment on one plane or another or the number of workmen required every night to work on the machine in order to keep it ready for a full day's operation the next day.

These latter items are of much greater import than ton-miles per gallon. These are especially important in a freight airplane where, though safety may not be thought the major item, the security of investment alone requires that safety be made the fundamental in order that the fewest possible breakages and interruptions to the service may be had.

Therefore, after one has laid out a design with a high range of speed and high figure of ton-miles per gallon of cargo, he must remember that the vital things are those which relate to elimination of crashes and minimum of upkeep on the field. Such items as quickly-detachable wings, tail surface units, engine units, landing gear, etc., for quick replacement are important and necessary if operating costs of planes are to be brought down to a feasible figure.

To keep an ordinary twin-motor Liberty engine cargo-carrying plane in the air with all terminal expense, repairs, depreciation, etc., costs approximately $100 per hour for a capacity of twelve people. Such a figure is not and cannot be made commercial. It is possible, however, to design a plane of six-passenger capacity which will operate at a cost of about the same per ton-mile as that of a limousine motor car, with the same passenger load.

It is just as foolish to say that the airplane will not be used as a general utility vehicle within its own field after it is once developed, as we now think it foolish on the part of those men in the early days of the automobile who insisted that the motor car will never be anything more than a plaything of the rich. Produced in equal amounts, an airplane of equal passenger-capacity can be produced cheaper than a present high-class limousine.

All that remains to accomplish the object is for the financial vision to appear from somewhere to back the enthusiasm and ability of American airplane engineers, and if anyone doubts their ability as compared to foreign designers let him look at the comparative world's record for altitude, speed, long distance or any other item for Europe versus America, especially in view of the recent Pulitzer Race.

American Internally Trussed Wings

Our first structures in this country of the internally-trussed type were of the all-veneer type and we flew at Dayton Dec. 28, 1918 in all-veneer, internally-trussed monoplane for short experimental hops. The chief lessons learned from this plane were structural, except for the added knowledge gained that a long-chord wing could be controlled by closer-coupled tail units--that is with the tail brought up closer to the wing—than had been supposed heretofore. The recent report of the National Advisory Committee for Aeronautics denoting the feasibility of bringing the tail surfaces up closer to the wing, as a matter of *improving* stability, is in the line with this point. Later on another wooden monoplane was built, this being of the cabin type, and fitted with a 200 hp. Packard engine. This machine was found to be thoroughly controlable on test flights, but its wing curve gave insufficient lift for the specified fuel supply.

Due to financial circumstances in connection with the all-metal problem, work on this plane stopped for almost a year, and only recently has it been in the air again with new wings in definite work, and giving exceptional performance.

German Commercial Airplanes

While the Junkers monoplane is not a thing of beauty, yet its performance as a commercial airplane in the air was equal to anything that had yet been done, while on the ground its commercial practicability for replacements, dependability of construction, etc., made it as good a commercial possibility as anything seen in America up to that date. It was slightly underpowered for the load carried, and its maximum speed was not enough for American air work.

Other German metal jobs which have been built are the enormous Staaken Giant, built by the Zeppelin firm, and the Dornier planes, one of which has been purchased by the Navy Department. Both of these planes structurally are of unusual interest, but both, on the other hand, are too heavy to really perform to their designed maximum. These planes are un-

* Paper read before the Society of Automotive Engineers.

doubtedly steps, however, in the right direction, and it is my prediction that *all commercial planes of the future will be of all-metal construction.*

Undoubtedly, with the experience gained, the next step of the Germans in metal construction will save at least 20 per cent of the weight of their present planes, but this is true also of our own work.

Designing an Airplane for Commercial Work

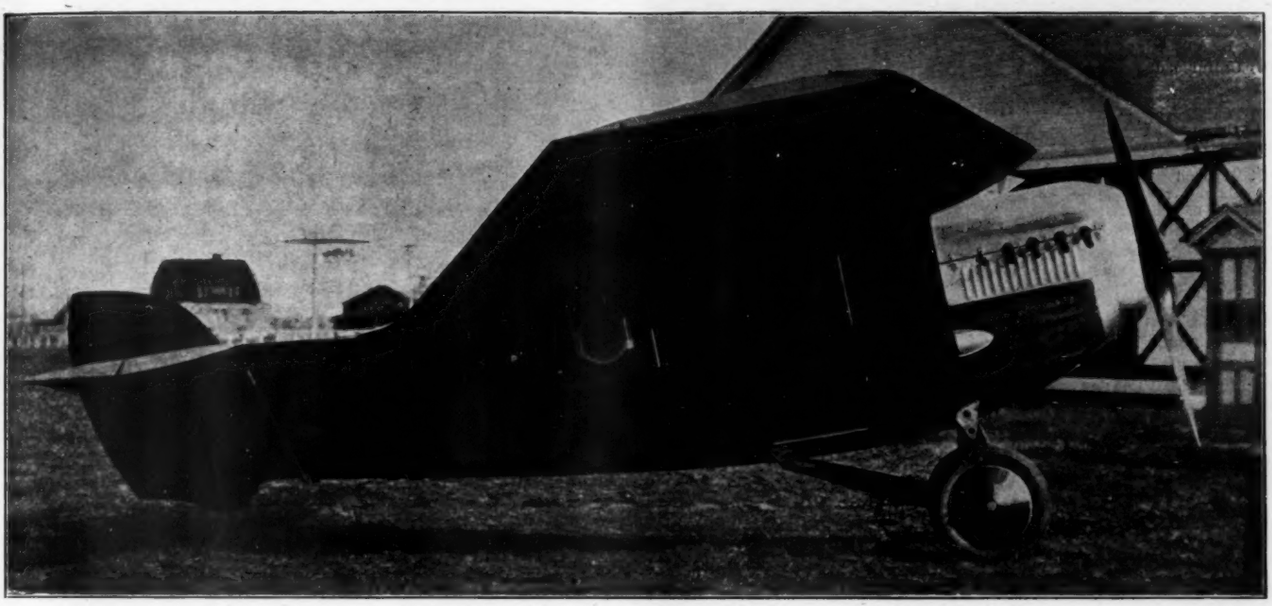
When it comes to designing an airplane for commercial work, we must begin to think in commercial terms. First, we must have in mind a feasible type of plane—a type which will fit the most possible number of conditions required by commercial lines, so that one may get maximum production and hence lowest first cost on this type of plane. We must, therefore, have as flexible a design as possible, so that with small changes we may fit different horsepowers of engine or different freight or seating arrangements, depending on whether the load is to be passenger or express. We must be able to operate over land or water, or both, indicating a change to different types of landing apparatus and the necessity, eventually, for amphibious landing gear.

Next, we must look to the requirements of structure, for the plane within the weight limit required, in order to carry the requisite cargo load over the given distance between terminals. If the line is 100 miles long and the plane has a useful load equal to seven passengers, he need only take the weight of one passenger in fuel and have a payload of six persons. If his flight is 6 hr., then he will need less passenger capacity and more gasoline capacity, and the plane should be so arranged that this flexibility can be had in production to fit different requirements.

Personally, I believe a plane of over 50-ft. span is not really a commercial proposition as yet in America, with landing fields as they are now. It is probable that a plane of not over eight-passenger capacity is about the maximum feasible for present-day production requirements. There are probably 100 routes where a five-passenger plane would be feasible to one where a twenty-passenger plane could be operated successfully. Four five-passenger planes also could probably be operated over this same line at less cost than one twenty-passenger and with much greater security and reliability.

There is as much difference between taking a plane from one point to another on a joy trip and operating a commercial line over the same route, as there is between a train crew taking a train over a strange route without any knowledge of where they are going and one operating under regular telegraphic control. The pilot must know his route and his terminals, his normal weather conditions and available landing fields in case of emergency, and all items which come with that particular route.

There are, too, items relating to vision, number of instruments and their location, security from fire, etc. From the standpoint of further safety, a landing gear must be furnished which will get the plane down under the worst possible conditions, without breakage. It is for this reason that recently along some of the worst routes rather small planes have been fitted with enormous wheels and tires, enabling them to take off of mud or even off of snow, with safety. It is very probable that commercial airplanes will be fitted with much larger diameter wheels than have been used and also with twin tires. New shock-absorbing means will be required, also.



Underwood & Underwood

The Stout "Batwing" three-seater cabin airplane (200 hp. Packard engine) to which reference is made in the accompanying article

With the coming of the internally-trussed monoplane and tapered wing it has been found possible to land at steeper angles than will the old type biplanes, thus allowing a much quicker stop after landing.

Improvements in Aircraft

The airplane iteself is improving rapidly. Metal constructions are bringing an entirely new era of light weight and strong structures unaffected by any weather conditions. They bring also a possibility of quantity production at low cost. Engines also are rapidly improving. It is my belief that for under 300 hp. the radial air-cooled engine has the greatest business possibility. It also allows better vision, lighter engine-supporting structure and can be built cheaper. The air-cooled engine also operates better in extremes of heat and cold than one which is water-cooled.

Motors will gradually be arranged in such form that the noise is left behind, not to disturb passengers or pilot. Passenger compartments must be thoroughly ventilated and the vision must be exceptional, as well, to prevent seasickness. The one advantage of the monoplane type with the wings above the fuselage, is that the people riding have such a perfect vision of the ground beneath and such little opportunity to become dizzy by losing the horizon among the white clouds overhead—or supposedly overhead.

It is very probable that commercial planes also will carry as part of their standard load spare wheels and a spare propeller, for emergency use, until such times as landing fields become well enough equipped so that these parts will be available on short notice from almost anywhere.

Ground Expense

To visualize to the engineer some of the items of ground expense which must enter into the design of a commercial airplane, I am attaching a general outline of costs and methods of figuring operations of a proposed line between Cleveland and Detroit. In this line, I have taken 150 lb. as a unit, whether it be passenger or freight. If a passenger weights over 150 lb., he would pay excess baggage at the usual rate per pound.

PROJECTED FREIGHT-PASSENGER AIR LINE, DETROIT TO CLEVELAND

Seaplanes necessary because of no available landing fields near city centers. Seaplanes can land passengers at city centers.

Railroad distance	169 mi.
Air distance	93 mi.
Railroad time	6 hr.
Airplane time	1 hr.
Railway fare (with pullman)	$7.30
Airplane fare	15.00
Time saved round trip	10 hours for $15.40

COMPARISON OF PRESENT-DAY TWIN LIBERTY FLYING BOAT AND MODERN ALL-METAL COMMERCIAL PLANE.

(a) Useful load	3800 lb. new 2500 lb. old 3000 lb. average	1600 lb.
(b) Time Detroit to Cleveland, 100 mi.	1¼ hr.	1 hr.
(c) Fuel 2 hr. @ 0.6 lb. per hp. hr.	960 lb. 160 gal.	240 lb.,40 gal.
(d) Pay load	2040 lb.	1480 lb.
(e) Speed	85 m.p.h.	110 m.p.h.
(f) Water Soakage		
Normal	Hull—500 lb. Wings—None.	
In Rain	Hull—500 lb. Wings—600 lb.	30 lb. Surface wetness
(g) Engine replacement	Takes 2 days time (3 men)	20 minutes (2 men)
(h) Hangar required	100 x 60 x 20 at each end of line. Plane stored ashore to dry out.	For repairs only 30 x 30 x 12
(k) Docking crew at each end of line	three	one

ESTIMATED COSTS—DETROIT-CLEVELAND AIR LINE

	Old Type	New Type
Plane Cost	4 at $10,000	2 at $20,000
Spare engines	4 at 3,000	2 at 4,000
Spares	20 per cent	15 per cent
Terminal Equipment (h)	50,000	15,000
Fixed investment	$110,000	$69,000

ANNUAL EXPENSE BUDGET

	Old Type		New Type
Insurance—flying equipment 20 per cent	$8,000	15 per cent	$6,000
Insurance—spares & equipment	1,000		600
Pilots at $2000 retainer	3 or 6,000	2 or	4,000
Plane Upkeep			
Shop and crew of 12 men, etc.	50,000		
Shop and crew of 2 men			4,800
Replacements (33-1/3 per cent)	13,300	(20 per cent)	8,000
Advertising and Sales	10,000		10,000
Total Annual Expense	$88,300		$33,400
Capital required for first year's operation.	$200,000		$110,000

FLYING COSTS PER TRIP

Fuel Cost per trip @ 20c per gal.	$20.00	$4.00
Oil Cost	5.00	2.00
Pilot Bonus 5c per mile	10.00	10.00
Per cent fixed annual expense 1200 trips per yr.	74.00	27.00
	$100.00	$43.00
Pay load at 2/3 capacity average @ 10c per lb.	136.00	98.60
Profit per trip	$27.00	$55.60
Profit per day (four trips)	100.00	222.40
Profit per season, 1200 trips, approx.	32,400.00	66,720.00
Interest on investment	16 per cent	61 per cent

Landing Fields

Landing fields will come as soon as commercial planes begin operating. Commercial planes will come as soon as finance takes an interest in bringing them into being. There should be plenty of finances available the minute the engineer can show an airp'ane which can operate and pay a profit; and thus the vicious circle is again chasing itself around, just as in the old fight between automobiles requiring good roads and good roads requiring automobiles.

It is the duty of the airp'ane manufacturers, as well as of this Society by its influence, to give every incentive possible to the development of everything related to aircraft, that the tremendous right-of-way now available overhead may as quickly as possible be put to use; that New York and San Francisco may be brought as close together as Chicago and New York are today. When air travel comes, and the engineering and commercial ends related thereto are accomplished, not only will a new industry of greater scale than the automobile industry come into being, but the very vastness of this country will become a national asset, as the compactness of England was an asset to her when sea travel was paramount.

Helium Investigation

Investigative work on helium recently conducted by the Bureau of Mines may be divided into the following heads: Helium production at Petrolia, Texas; investigation of known and of probable areas of helium-bearing gas; helium storage; helium repurification after use in balloons; and investigations of gasses and liquids at low temperatures, with particular reference to obtaining data for use in perfecting methods for separating helium from natural gas by progressive selective liquefaction.

These activities have been conducted under the authority of the Army and Navy Helium Board. The funds were allotted in equal shares from the Army and Navy appropraations, and the technical work was performed under the general direction of the Director of the Bureau of Mines.

Helium storage investigations have narrowed themselves to testing the practicability of storage in mine workings. An experimental chamber was prepared for this purpose at the experimental coal mine at Bruceton, Pa., and work there is still in progress. Special field trips by engineers of the Bureau of Mines, to investigate the suitability of coal, salt and metal mines for the storage of helium have been completed.

A Low Temperature Laboratory

The installing of equipment in low-temperature laboratory in the Interior Building at Washington, D. C., is practically completed, and liquid air in quantity is now being produced. The primary object of this laboratry is to investigate gasses and liquids at low temperatures, with special reference to the separation of helium from natural gas. The scientific data obtained will be applied in the helium plants to obtain more efficient operation and to reduce cost of production.

The laboratory, formally opened by Mme. Marie Curie on May 21, 1921, is under the direction of Dr. R. B. Moore. During the past fiscal year the Army built a helium repurification plant at Langley Field, Va., using the Claude system. Dr. Harvey N. Davis, of Harvard University, was actively associated with this work. In the spring the Army asked the Bureau of Mines to take charge of the work and complete it and furnished the funds for the purpose. The plant was put under the general supervision of Dr. R. B. Moore, who placed D. M. Ferris in active charge. The Army also transferred to the Bureau of Mines a helium repurification unit on two railroad cars, one car having the power equipment and the other the refrigeration and refining equipment. The staff of the Cryogenic Laboratory is designing the charcoal repurification unit which will be used in connection with this plant, which is also in charge of Dr. Moore.

Field investigations of possible supplies of helium in natural gas were completed during the year, every known gas field in the United States having been tested. Results were markedly successful, as they have shown that this country contains the largest supply of helium-bearing natural gas in the world.

The experimental helium plant at Petrolia, Tex., using the Jeffries-Norton process, was in operation during the year at various times, and helium was produced for short periods, yielding a product as high as 49 per cent helium. The plant, however, was not developed into an actual operating unit, and on account of Congress greatly reducing the funds for helium work during 1921 and 1922, it was decided to discontinue operations at Petrolia in July and to place the plant in a stand-by condition until further fundamental data required for efficient operation could be obtained through work on a smaller scale. In the meanwhile the larger part of the funds appropriated for helium work will be used for the production of helium in the plant erected by the Navy Department at Fort Worth, Tex., which is now in regular operation producing helium. The plant at Petrolia has been under the executive supervision of H. S. Mulliken, of the Washington office of the Bureau of Mines, with H. F. Fisher in active charge at Petrolia.

"Who's Who in American Aeronautics"

(Copyright, 1921, by The Gardner, Moffat Co., Inc.)

The biographical sketches of men who are prominent in American Aeronuatics are printed periodically in AVIATION. The first series will be shortly published in a more durable form, and revised issues will be published semi-annually to take care of the frequent changes in station of Army and Navy officers, and such other changes as may occur. As errors and omissions are liable to occur in a compilation of this character, interested parties are requested to notify "Who's Who" Editor of the necessary corrections so the record may be kept up to date.

Russell G. Jones

JONES, RUSSELL G., Pilot, U. S. Air Mail; born, Van Wert, Ohio, March 31, 1885; son of William Bebb Jones and Ann (Alban) Jones.

Educated: Public schools of Van Wert, Ohio; Bachelor of Science in Electrical Engineering 1909, Case School of Applied Science.

Professional: 1909-1910, Hydraulic Engineer; 1911, Efficiency Engineer, Selby Shoe Co.; 1912-1916, Assistant Secretary and Accountant, Lumbermen's Mutual Casualty Co.; 1916-1917, Vice President and General Manager, Cruiser Motor Car Co.

Aeronautical Activities: Enlisted May 1917; commissioned 1st Lieut., Ellington Field, Jan. 1918; served as instructor in bombing school until July 1918; served overseas with 1st Handley-Page Night Bombing Unit from Aug. 1918 to Armistice; with Curtiss Aeroplane and Motor Co., July 1919 to June 1920; pilot with U. S. Air Mail from July 1920 to date.

Flying Rating: Reserve Military Aviator.

Present Occupation: Pilot, U. S. Air Mail.

Address: 296 E. 149th St., Cleveland, Ohio; home, 508 S. Washington St., Van Wert, Ohio.

James C. Fair

FAIR, JAMES C., Telephone Business; born, Natick, Mass., Feb. 7, 1885; son of Martin Fair and Mary Fair.

Educated: Public and high schools; Lowell Institute.

Professional: Telephone business.

Aeronautical Activities: Kelly Field Ground School; Eberts Flying School; Commandant of Flying Cadets, Eberts Field.

Flying Rating: Reserve Military Aviator.

War Service: Enlisted private 1st class, Sept. 14, 1917; Cadet, Kelly Field and Provisional 2nd Lieutenant; commissioned 1st Lieutenant, Dec. 1917; Commanding Officer, 181st Aero Squadron, Kelly Field No. 2; Intelligence Officer and Officer in Charge of Military Police and prisoners.

Member: Aero Club of America.

Present Occupation: Telephone & Telegraph Co., Boston, Mass.

Address: 125 Milk St., Boston, Mass.; home, 16 Wilson St., Natick, Mass.

Paul F. Collins

COLLINS, PAUL F., Pilot, U. S. Air Mail; born, Wooster, Ohio, April 22, 1891; son of Joseph V. Collins and Jeanette Collins; married, Betsy Robinson, Aug. 2, 1919.

Educated: Public schools of Stevens Point; Wisconsin State Normal School; 1912-1914, University of Wisconsin.

Aeronautical Activities: Graduate University of Illinois Ground School, Oct. 1917; instructor in acrobatics, Ellington Field, Jan. 1918 to Aug. 1918; instructor, Clermont Ferrand, France; Issoudun pursuit school; 138th Aero Squadron; Sales Department, Curtiss Aero and Motor Corp. from Nov. 1919 to Sept. 1920; with Aircraft Fireproofing Corp., as test pilot from Sept. 1920 to Jan. 1921; U. S. Air Mail, Feb. 1921 to present.

Flying Rating: Reserve Military Aviator.

War Service: As above.

Present Occupation: Pilot, U. S. Air Mail.

Address: Air Mail Field, Cleveland, Ohio; home, Stevens Point, Wis.

Howard L. Mingos

MINGOS, HOWARD L., Writer; born, Athens, Pa., April 24, 1891; son of George Wm. Mingos and Charlotte (Lynch) Mingos.

Educated: Public schools of Athens, Pa.; 1911-1914, Pennsylvania Museum and School of Industrial Art.

Professional: Newspaper reporter and special writer, 1911-1917; magazine contributor and illustratir; writer of articles and publicity on civil aviation since 1919.

War Service: U. S. Army, Infantry and Air Service, July 1917 to Dec. 1918.

Member: Aero Club of America; City Club of New York.

Present Occupation: Manufacturers Aircraft Association.

Address: 80 Washington Square, New York City.

Edward Albert Johnson

JOHNSON, EDWARD ALBERT, Commercial Aviation; born, Newport, R. I., Jan. 14, 1890; son of Christian Frederick Johnson and Alice (Anderson) Johnson; married, Loraine Caroline Carrier, Dec. 18, 1916.

Educated: Public schools of San Francisco and Oakland, Calif.; Business College of Sacramento, Calif.; Polytechnic College of Oakland, Calif.

Professional: 1909 to 1915, President and General Manager of Motor Express and Motor Drayage Co. of San Francisco.

Aeronautical Activities: Taught to fly at Curtiss School at Buffalo, N. Y., 1915; sent to England as Curtiss representative; received land instruction at Hendon, England; returned to United States in 1916 and appointed Chief instructor of Flying in Signal Corps, Sept. 1916; U. S. Air Service.

Flying Rating: Aero Club License No. 3276, Dec. 1918; Expert Certificate No. 215, Dec. 1918; Underwriters Laboratories License No. 1004.

War Service: Sept. 1916 to Dec. 1918, Chief Instructor, U. S. Army; Test Pilot, McCook Field, June to Dec. 1918; Air Mail, 1919.

Member: Aero Club of America.

Present Occupation: Johnson Airplane & Supply Co. of Dayton, Ohio.

Address: Wilmington Pike; home, 1024 Creighton Ave., Dayton, Ohio.

Charles Lepel Richardson

RICHARDSON, CHARLES LEPEL, Radio Instructor; born, Toronto, Canada, June 7, 1891; son of Charles Gordon Richardson and Helena Richardson; married, B. Louise Porter, July 11, 1916.

Educated: Public schools of Elizabeth, N. J.; Cross Hill Academy, Glascow, Scotland; preparatory school of Elizabeth, N. J.; Provisional School of Instruction, Canadian Army.

Professional: Assistant Engineer, Dominion Metals, Toronto, 1909-1910; Chief Engineer, Metals Chemical Co., Welland, Canada, 1912-1916; Assistant to President, Niasco Chemical Co., New Market, N. J., 1917-1919; Maintenance Engineer, Cobolt Chemical Co., New Market, N. J., 1919-1920; conducted special experiments for American Smelting and Refining Co., 1921.

Aeronautical Activities: Model designer; received first prize at Toronto exhibition for a Bleriot No. 12 model in 1912; in charge of observation stations at Toronto flights of Count De-Lesseps and Wright machnies, 1912, instructor in aviation.

War Service: Sergeant and Instructor in Radio and Military Engineering, 1914; Engineer Officer, 1915; with 2nd Field Co. Canadian Engineers.

Member: Chemists Club, N. Y.; British Great War Veterans Association.

Present Occupation: Chief Radio Instructor, American Airways.

Address: College Point, Long Island, N. Y.; home, 407 Rahway Ave., Elizabeth, N. J.

Theodore L. Tibbs

TIBBS, THEODORE L., Pilot Instructor; born, Montreal, Canada, January 23, 1883; son of Horace S. Tibbs and Clarissa B. Tibbs; married, Estelle L. Stuttaford, December 1908.

Educated: 1893, Margate College, 1895, Eaton House School, 1898-1900, Clifton College, all of England.

Professional: Secretary to General Manager, G.T.R., 1900-1902; Operating Department, G.T.R., 1902-1904; Canadian Manager, Armour and Co. of Chicago, 1904-1910; Canadian Pacific Railroad, Operating Department, 1910-1914.

Aeronautical Activities: Canadian Infantry, 1914-1915; Royal Flying Corps, 1915-1917; Royal Air Force, 1917-1919; 1919-1920-1921, Commercial Aviation as salesman, flying instructor and passenger carrying.

Flying Rating: Pilot and Flight Commander, R.A.F.

War Service: As above.

Present Occupation: Chief Instructor, American Airways Training School.

Address: 1st Ave., 3rd St.; home, 615-13th St., College Point, Long Island, N. Y. N. J.

Chester Eaton Wheeler

WHEELER, CHESTER EATON, Landscape Architect; born, Lowell, Mass., Aug. 23, 1891; son of Charles O. S. Wheeler and Clara Anna Eaton; married, Gladys Louisa Melloon, Nov. 3, 1915.

Educated: Public schools of Lowell, Mass.; Bachelor of Science, 1914, Massachusetts Agricultural College.

Professional: Engaged in landscape design and engineering since 1914; development of Bronx River Parkway Reservation.

Aeronautical Activities: Training at Camp Stanley, Kelly Field and Garden City, Long Island; transferred to Washington, D. C. as Supply Officer for printed matter, Jan. 1918; transferred to Souther Field as Assistant Adjutant, May 1918; Personnel Officers School, Camp Gordon; Personnel Adjutant, Souther Field to date of discharge.

War Service: Nov. 1917 to Jan. 1919.

Present Occupation: Landscape architect.

Address: Bronx Parkway Commission, Bronxville, N. Y.; home, 114 S. 3rd Ave., Mt. Vernon, N. Y.

Raymond Ware

WARE, RAYMOND, Commercial Aviation; born, Boston, Mass., June 13, 1883; son of William M. Ware and Florence (Brewer) Ware; married, Catherine Munro Schurman, July 12, 1919.

Educated: Edward Everett; Mechanical Arts School; 1907, Naval Architecture, Mass. Inst. of Tech.

Professional: B. F. Sturtevant Co.; Hayden, Stone & Co.; Thomas-Aeromotor Co.; Thomas Bros. Aeroplane Co., 1915-1917; Thomas-Morse Aircraft Corp., 1917 to present.

Aeronautical Activities: Secretary, Thomas Aeromotor Co.; General Sales Reperentatives, Thomas Bros. Aeroplane Co.; Secretary and Sales Manager, Thomas-Morse Aircraft Corp.

Member: Society of Automotive Engineers.

Present Occupation: Secretary, Thomas-Morse Aircraft Corp.

Address: Heights Court Apt., Ithaca, N. Y.

Harry J. Marx

MARX, HARRY J., Consulting Aeronautical Engineer; born, Brooklyn, N. Y., June 1, 1893; son of Conrad Marx and Emma S. Marx; married, Augusta C. Schwinge, June 4, 1917.

Educated: Public schools of Brooklyn, N. Y.; University of Pennsylvania.

Professional: U. S. Navy Department, 1914-1915; U. S. War Department, 1916; Standard Aircraft Corp., 1917-1918; City College of New York, 1917-1920; Van Muffling & Marx, Consulting Aeronautical Engineers, since 1920; New York School of Aeronautics, 1920 to present.

Books: Aeronautical Courses for C.C.N.Y. and N.Y.S.A.

Member: Society of Automotive Engineers; A.A.E.; Aeronautical Society of C.C.N.Y.

Present Occupation: Consulting Aeronautical Engineer.

Address: 299 Madison Ave., New York City; home, 702 Chauncey St., Brooklyn, N. Y.

John M. Rogers

ROGERS, JOHN M., Aeronautical Engineer; born, Tonawanda, N. Y., Sept. 25, 1891; son of Edward H. Rogers and Jennie P. Rogers.

Educated: Public schools of Tonawanda, N. Y.; M.E. 1915, Cornell University.

Aeronautical Activities: Engineer, Curtiss Aeroplane and Motor Corp., 1915-1917; Engineer, Bureau of Construction and Repair, Navy Department, 1917-1918; Chief Engineer, Alexandria Aircraft Corp., 1918-1919; Sales Engineer and Quality Manager, Wright Aeronautical Corp., 1919 to date.

Member: Cornell Club of New York; Aero Club of America; Society of Automotive Engineers; Hamilton Club, Paterson, N. J.

Present Occupation: Quality Manager, Wright Aeronautical Corp.

Address: Wright Aeronautical Corp., Paterson, N. J.

Organization of French Civil Aviation

Department of Commerce Report Showing Organization of French Civil Aviation Bureau and Activities of Air Lines

The following report on the present state of French commercial aviation has been received by the Department of Commerce from its commercial attaché in Paris—EDITOR.

The French government has created a special aviation bureau attached to the Ministry of Public Works and known as the "Under-Secretariat for Aeronautics and Aerial Transport." This bureau is directed by Laurent Eynac, a member of the Chamber of Deputies, an aviator during the war, and former director of the French Petroleum and Gasoline Supply Services. The Under-Secretariat for Aeronautics not only centralizes all technical information but distributes the subsidies granted by the French Parliament to airplane operating companies.

Financial Assistance to the Companies

These subsidies were authorized by law dated July 31, 1920. During that year 30,000,000 francs were distributed to the companies thus enabling 185 airplanes to be kept in operation.

During 1921 31,700,000 francs will be distributed.

What the Government Bureau Does

The Under-Secretariat of State for Aeronautics accordingly has two distinct services under his orders: on the one hand (1) the Technical Research and Experimental Division, on the other (2) the Aerial Navigation Divison.

(1) The first mentioned division is subdivided into two services: (a) the Airplane Construction Service which places the orders and supervises the construction of airplanes and motors required by the government ministers utilizing aviation (war, navy, colonies). (b) The Technical Aviation Service where all research work is done. This service is divided into a number of specialized bureaus: aviation, hydroaviation, aerostatation, motor construction, propellers, armament, meteorology, etc.

Attention is at present concentrated on the study of all-metal construction and on the perfection of light-weight alloys. Other problems which are being closely studied in the laboratories of Issy-les-Moulineaux, Saint Cyr, Eiffel and Chalais-Meudon are speed, resistance, high altitude flying, landing, armament, radiotelegraphy, wireless telephony, automatic stabilizers, and a system for the control from the ground of a pilotless airplane in flight by wireless telegraphy so as to avoid accidents during experimental flights with new machines or systems.

Perfecting the Present Airplane Motor

Moreover, the manufacturers of airplane motors have been officially requested to devote their attention to the construction of a motor more durable and reliable than those at present in use.

An airplane motor at the present time runs for 200 hr. at a maximum. Taking for example a flight on the Paris-Warsaw line, which lasts approximately 10 hr. a motor could therefore run for only twenty trips or ten round trips. The cost of one of these motors is approximately 60,000 francs ($12,000 at par value of the franc), so that the depreciation represents 3000 francs ($600 at par value) per trip.

To Connect France with Colonies

France has important colonial possessions on the opposite shore of the Mediterranean whose business development is at present so rapid that it is becoming more and more necessary for them to have improved communications with the mother country.

A line is already in operation between Toulouse, Barcelona, Malaga, Rabat and Casablanca. In the very near future there will be one from Antibes to Tunis via Nice and Ajaccio. Plans are being made for the establishment of an airship line between Marseilles or Toulon and Algiers, and of an airplane line from Oran to Morocco, and from there on to Toulouse via Spain.

Airplanes can also be of great use for establishing connections with colonizing groups which are penetrating toward the interior where railroads do not exist. An experimental line is running once a week between Dakar (Senegal and Kayes (French Equatorial Africa). Other most interesting experiments are being made in Indo-China and French Guiana.

French International Lines

The international lines now in operation are:

Paris-London (2½ hr. fare 300 francs).

Paris-Brussels-Amsterdam (1½ hr. to Brussels, fare 150 francs).

Paris-Strasbourg-Prague-Warsaw, which has just been extended from Prague to Budapest and Bucharest and will will soon be extended to Constantinople (9 hr. for Warsaw, 6 hr. for Prague, 2½ for Strasbourg; fare cheaper than by railroad sleeping car.)

Traffic Over the Lines

The French are at present operating 5200 km. (approximately 3250 miles) of air lines. The importance of traffic over these lines may be realized through the following statistics representing traffic during the first six months of 1921:

848,700 km. (approximately 530,437 miles) covered in flight.

3388 paying passengers carried.

70,000 kg. (about 154,000 lb.) of packages transported.

3470 kg. (about 7634 lb.) of letters and postal matter transported.

These figures show marked increases as compared with those for 1920.

The question of carrying mail is of importance to the airplane companies as will be seen by the following example: for the transportation of a letter from Paris to Warsaw, the company receives the postal surtax of 1.75 francs. There are on an average eighty letters per kilogram (about 2.2 lb.). Therefore, one kg. represents 140 francs, and 100 kg. represents 14,000 francs. It appears that the total operating cost of an airplane is nine francs per km. There are 1500 km. (approximately 9375 miles) from Paris to Warsaw, representing therefore 13,500 francs expenses.

Accordingly with present prices it would require only 100 kg. of mail on each trip to cover the operating expenses of the company.

Aviation in Switzerland

The Federal Air Office has issued a notice to the effect that, by order of the German Department of Transportation, airplanes of a military type constructed in Germany are no longer permitted to circulate in the air over that country. This prohibition also applies to civil airplanes registered in Switzerland but belonging to the airplane types prohibited in Germany, provided their papers do not contain a special certificate having come from the German Minister of Transportation stating that they were constructed before January 10, 1920.

A new air service which completes the connection between London and the Swiss winter resorts was opened by a French firm recently. The new air line runs from Paris to Lausanne. At present it is necessary for passengers leaving the Croydon airdrome at London by one of the air expresses to spend the afternoon and night in Paris, leaving for Lausanne next morning. It is, however, hoped to so arrange the service ultimately that the whole journey can be completed on the same day, with just a short stop at Le Bourget (Paris).

Variable Area Wings and Tandem Wings

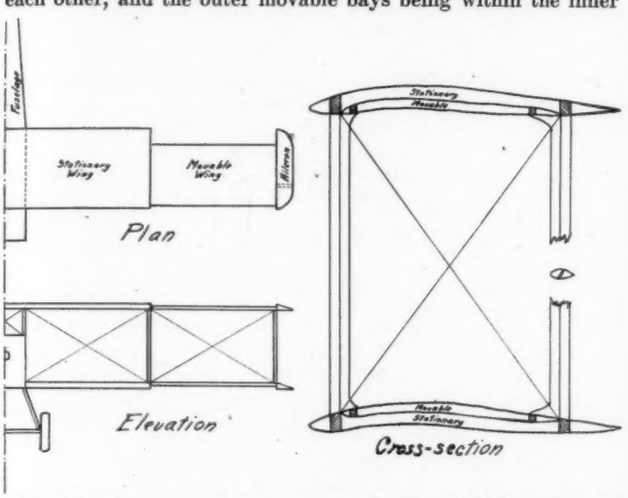
New System Suggested by Captain N. Carolin, A.S.-- A Correspondence on the Wragg Tandem Wings

The accompanying sketch illustrates a variable wing area arrangement which Captain Norbert Carolin, A. S., proposes in line with the suggestions made by Harlan D. Fowler in our issue of Dec. 5, 1921, that "the variable area principle offers the most promising results in improving airplane performance."

The Carolin Wing

It will be noted that the design is based on sound, engineering practice, in that it is a modification of the standard, orthogonal, Pratt trussed biplane, in which the outer bays slide into the inner bays.

When in the position of minimum area or high speed position, the struts and wires of both bays streamline with each other, and the outer movable bays being within the inner



Variable wing area system proposed by Capt. Norbert Carolin, A. S.

bays strengthen them to withstand the greater stresses resulting from high speed.

In the low speed position the benefits of increased aspect ratio and increased aileron control obtain.

At first glance it would appear to be impossible to slide one complete Pratt truss within another without interference. A little thought however will reveal that this can readily be accomplished.

Each movable bay is operated by four endless cables. Rollers, on the inner ends of the movable bays and the outer ends of the stationary bays, bear on metal rails on adjacent opposing spars.

While it is probable that a high speed of four times the low speed could be obtained in a plane of this design, this point can not be accurately determined until the additional weight due to this construction is ascertained.

The Wragg Tandem Wings

In connection with the tandem wing arrangement invented by C. A. Wragg of Washington, D. C., to which reference was made in the afore named article, we have received a communication from Mr. Wragg which is reproduced below together with Mr. Fowler's reply.

Editor, AVIATION :—

In the article on "Means for Improving Airplane Performance," by H. D. Fowler, in AVIATION Dec. 5, it is said, in reference to Fig. 3, that "the tandem principle has offered but little advantage so far, and for speed purposes it did not meet the requirements."

As I am the inventor of this device I am writing to correct this statement, which in my judgment gives an entirely wrong impression. I presume that the data regarding Fig. 3 was obtained from Report 103 at the Bureau of Construction & Repair, Navy Department. This Report covers a combination of an RAF6 for the leading wing and a Sloane in the rear. The combination was of course not the best for indications of value for speed purposes, and its use in this way was protested by me. But even so, certain data, which was suppressed from the Report, was obtained on the *individual* sections while in the position of the *compound;* that is, one was put on the balance arm while the other was placed in the position that it would occupy in a machine. The result on the forward section showed that not only the L/D of the RAF6 was improved but that such improvement was obtained by reduction of K_x as well as increase of K_y. The results on the rear section showed 50 per cent improvement on what was to be expected in view of the angle of incidence at which the forward one was set.

The conclusion is that by the selection of more suitable sections, which I defined and endeavored to have tested at the time, such a tandem system offers the greatest possibilities for speed purposes, and also for better load-carrying capacity.

C. A. WRAGG

Editor, AVIATION :—

The response of Mr. C. A. Wragg to come forward and support his variable area wing principle is appreciated by the writer. It should be apparent, however, that even to the best informed it sometimes occurs that certain necessary data or knowledge of an invention is unknown to them. Such was the case with my conclusion on Mr. Wragg's device in respects to the characteristics of the particular test he has in mind. When I saw the description of this principle I neglected to make note of the values obtained from the test, but recollected the general idea of the invention. As a general rule if the test indicates superiority I make such notes as are needed. This is probably what happened in this case.

In regard to the increased coefficient values it should be noted here that all the devices which have been tested in the wind tunnel or in the air are in their very infancy of development. It is generally possible, however, to arrive at a conclusion as to whether such an idea is practical when the results of such tests are roughly compared with the best obtained in standing practice. Therefore, the test of Mr. Wragg's device was made under similar circumstances and conditions as obtained with those on which I was able to secure data and make their relative comparison.

It should be noted that except for the increased area surface between the front and rear aerofoils that the wing would resemble that of the Howard Wright, and that its relative efficiency would be judged about as indicated in Table II of the article mentioned.

I should appreciate such data as were obtainable from the test of Mr. Wragg's aerofoil and place it under the same restrictions as those upon which the other devices were placed. The coefficients should be the results of a test of the two aerofoils simultaneously tested, with the space filled in the center to obtain the maximum K_y. If this data will be submitted to the conditions stipulated it will then be possible to arrive at some definite conclusion.

So far as I know all aerofoils tested in tandem have shown reduced efficiency, except for the ideal stability characteristics, as indicated in the Drzewiecki airplane, when the wings are spaced some distance apart with no surface between them. Consequently, speed is affected.

It is quite possible that due to the variable area principle involved this invention would indicate favorable results, and I would deem it a favor if Mr. Wragg would contribute such data as may sustain my conclusion regarding the superiority of the variable area wing principle over those otherwise so far conceived.

HARLAN D. FOWLER, A. E.

American Airways Mechanics' Course

A thorough one-year course of instruction to qualify as an expert airplane mechanic is now being given by American Airways, College Point, New York. The more important branches of the course are as follows:

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Wood Working. Hull construction and repair; cabinet working and carpentry; steam box and wood-bending. Arithmetic; designing and draughting; glider building and experimental work; model building.

Wireless Telegraph, etc. Construction and repair of wireless telegraph and telephone transmitter and receiver. Morse code, sending and receiving; theory of electricity and physics; aerodynamics, etc. All forms of visual signalling; wig wag, semaphore, etc. Practical seamanship.

The officers and instructors of American Airways are Hugh D. McKay, Executive Officer; in charge of Administration; formerly pilot Flight Lieutenant in Royal Flying Corps; W. G. Schauffler, Jr., in charge of Operations; formerly Major commanding 90th U. S. Aero Squadron, and 3d Corps Observation Group in France; commands the 302d Aero Squadron, U. S. R.; Theodore L. Tibbs, Chief Instructor and Head Pilot; Captain in the Royal Air Force from 1915-1919; Henri Franchimont, technical Aerodynamic Expert; French authority on designing, theory of flight, draughting, etc.; Charles L. Richardson, Radio and Electrical Instructor Expert Wireless Construction man and Operator; formerly of the Engineers, U. S. A.; Antonio Bragoz, Practical Aviation Mechanic; Expert in mechanical instruction of school; Henry Meyer, Instructor-foreman of wing-working; Expert wing builder and fabric worker. Formerly for three years with L. W. F. aircraft factory.

Staff of N.A.C.A.

The present staff of the National Advisory Committee for Aeronautics is as follows:

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The members of the committee are appointed by the President, and all members as such serve without compensation. The full committee meets twice a year, the annual meeting being held in October and the semi-annual meeting in April.

An Executive Committee of seven members is provided by regulations for carrying out the work of the Advisory Committee.

Fokkers in Spain

The Spanish Air Traffic Co. of Madrid has bought two Fokker airplanes of the latest type. These will be put into regular service on an airline between Sevilla, Spain and El Araish (Larache), Morocco. The distance between these points is 170 miles and includes the crossing of the Strait of Gibralter.

This line, which also carries Spanish mails, was recently opened with much ceremony, including a blessing of the machines by the Bishop of Sevilla.

Admiral Moffett on Civil Aviation

"If the great transcontinental railroads of the country would take a hand in the development of aviation, we would soon forge ahead in the establishment of commercial and mail routes and the general establishment of aerial highways," said Admiral W. A. Moffett, Chief of the Bureau of Naval Aeronautics. "With the valuable rights-of-way stretching across the country, generally in direct lines east and west, north and south, going nearly everywhere," he continued, "the railroads are in a position to open up airways with but little additional expense."

By way of commenting on the new bill for the establishment of a Bureau of Aeronautics in the Department of Commerce recently introduced by Mr. Wadsworth in the Senate, and by Mr. Hicks in the House, the Chief of Naval Aviation said that the establishment of such a Bureau would make commercial aviation practicable in this country. The laws and regulations would thus be controlled, it was said, but aid would still be required in operation and organization of routes.

By following the railroad rights-of-way, he pointed out, direct lines of aerial communication could be established and with little work wider spaces could be cleared and leveled for emergency landing fields along the tracks at necessary intervals between stations.

That it would be perfectly practicable to build landing platforms near the present railroad passenger stations over the tracks or on the roofs of some of the present stations, notably the new Union Station in Chicago, is the belief of naval aviators. Where the space is restricted they say the catapult for launching planes recently perfected by the Navy, and the arresting gear for the landing of planes on board ship, could be used to advantage.

Pioneer Co. to Handle K-L System

The Pioneer Instrument Co. of 136 Havemeyer St., Brooklyn, N. Y., has taken over the manufacture and sale of the K-L Fuel System, formerly handled by the K-L Automotive Specialties Co. C. B. Kirkham will continue to supervise the engineering work in connection with the apparatus and its installation.

This fuel system consists briefly of an engine-driven pump, a hand-operated pump of the "wobble" type, and two strainers, together with the necessary fittings for use with two tanks.

The fuel flow is from one of the tanks through the strainer to the hand-pump, and through this to the power-pump. From the latter it is delivered to the carburetor under a slight pressure. When using the hand-pump, in starting or in emergencies, the fuel is pumped to the carburetor through a by-pass in the power-pump. With the engine running, the only fuel line under pressure is that from the power pump to the carburetor.

This system eliminates most of the "plumbing" otherwise necessary and assures a supply of fuel under all conditions.

Sport-Farman at Bolling Field

Recently the personnel at Bolling Field were given a very fine demonstration of the new Farman Sport plane, piloted by former Captain Robertson of the Royal Air Force. This airplane, which created a furore in aviation circles by its performance at Omaha, is a two-seater biplane, equipped with a 60 hp. LeRhone rotary motor. With a wing span of 24 ft. and a total weight of less than 500 lb., it has a speed range which goes far toward filling the need of a plane that can land and take off almost anywhere, beside being speedy and maneuverable. The maximum speed is rated at more than 90 m.p.h., and its nomal speed ranges down to a landing speed of between 10 and 20 m.p.h., depending upon the wind. On Bolling field, against a 12-mile wind, it landed in less than 50 ft., and took off in less than 60 ft., climbing at an angle of more than 45 deg. Its maneuverability is unexcelled by anything ever seen at Bolling Field, and yet it cannot be made to spin. Its performance convinced everyone at the field that a real step forward had been made in the onward march of aviation.

On Federal Air Legislation

A correspondent takes issue with Maj. W. Jefferson Davis whose article "Legal Aspect of Federal Air Legislation" was printed in the Nov. 28 issue of AVIATION. He finds that the author, in his second paragraph, premises his discussion on his interpretation of the recent report of the American Bar Association's Special Committee on the Law of Aviation.

Major Davis wrote that an "extremely pessimistic view is taken by those who advocate the passage of a constitutional amendment. The theory of the necessity for such an amendment is founded solely upon the premise that the air is owned absolutely by the surface owner, and that all flight over such air space constitutes trespass."

Our correspondent asserts that Major Davis misinterpreted the Bar Association Committee's report. He refers to page 14 of the report, where the following occurs: "There is one prepossession which we have mentioned; the bugaboo in the legal or supposed legal maxim. *'Cujus est solum, ejust est usque ad coelum,'* (Who owns the ground owns the sky above it) * * * * * * * The right to go was deemed a dominant right over the right of adjacent ownership. * * * * And so, it was recognized as a principle of English law that when the journey required, the private right was subordinate to the common right."

And on page 18 of the report we find, relative to the doctrine of private ownership of space: "There is no more serious embarrassment to the development of air navigation than the acceptance of this doctrine as thus stated. We are not satisfied that it correctly states the actual condition of the law. We have already called attention to the modifying principle, which in early times, the English courts seemed to have found no difficulty in applying to the law of the right of travel by highway. * * * * * We feel that this crucial proposition deserves the most careful consideration, and that the right of private property in the air so far as to effect exclusive ownership, to the extent of making the flier a trespasser in flight, and to require the exercise of eminent domain to establish air routes should not be so readily conceded. It seems to us that it should rather be incumbent upon the private owner to demonstrate the extent of private ownership, and that, since the convenient maxim which we have already quoted has never been applied to mere flight at great heights, it should be viewed as an unprecedented question involving rights which have never been asserted or enjoyed as an incident of such ownership; and there is no substantial reason for utilizing the maxim to extend private rights, never heretofore actually enjoyed, to the exclusion of the common right.

* * * * * "We feel that this committee can do no more beneficial service to the public and the common interests of all of our people than to challenge the proposition that it is an invasion of the rights of private ownership of property to utilize air for purposes of flight."

This conclusion in the report, says our correspondent, is a flat contradiction of the premise upon which Major Davis bases his article.

The Pressure Distribution over the Horizontal Tail Surfaces of an Airplane

N.A.C.A. Report No. 118

The investigation is divided into three parts, of which this is the first. This part includes the complete study of the pressure distribution over two horizontal tail surfaces, one a standard JN4H tail plane, and the other of special construction, which was thicker and with a plan form of higher aspect ratio. The pressures were recorded at flight speeds of 45 m.p.h. to 100 m.p.h., and at engine speeds of 600, 900, 1200 and 1400 r.p.m., in order to get all of the conditions that would occur in flight. At the same time various modifications were made in the airplane, such as moving the position of the center of gravity horizontally, and varying the tail plane in angle, section, and plan form. The number of holes on the tail were so numerous (over 200) that the total pressure of the tail under any conditions could be obtained very accurately by integration of the pressure distribution curve. The results are plotted in a large variety of ways in order to bring out as clearly as possible the exact distribution of pressure.

A copy of Report No. 118 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

THE CONTEST COMMITTEE of the AERO CLUB OF AMERICA

Requests all owners (individuals or companies) of aircraft in the United States to register in order that the Committee may

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Foreign News

Chile

The government of Chile has under consideration a fifteen-year exclusive concession for commercial aviation rights. Information received by the Department of Commerce from Rollo S. Smith, secretary in the office of the Commercial Attaché at Santiago, states that a petition from the local representative of the Spad and Bleriot airplane factories has been submitted to the Chilean government, seeking a twenty-year exclusive franchise to install and operate an aerial service between Iquique, Concepcion, and intermediate cities. The tariffs to be put in force, if the franchise is granted, will be submitted to the government for its approval, and the landing stations will be at the disposition of military aviators. An advantage claimed for the proposed service is that the trip from Santiago, the capital, to Antofagasta—a distance of 1,552 kilometers by rail and requiring a two days' journey—could be accomplished by airplane is something over five hours at a cost per passenger of 500 pesos for the round trip.

France

The famous French flying "ace" Nungesser has opened a school of aviation at Orly. The school has received a State subsidy, and numerous pupils have been enrolled. M. Eynac, under-secretary of state for aeronautics, who visited this establishment, expressed the government's satisfaction at the excellent results obtained from the training given.

It was reported from Paris on Nov. 22 that Alfred Leblanc, the well known balloonist and pioneer aviator, had died at the age of fifty-one after a long illness. Alfred Leblanc was born in Paris in 1869 and was quite a successful business man. He became an enthusiastic balloonist many years before the beginning of aviation, and when M. Louis Blériot began his aviation experiments with towing man-lifting kites behind motor boats M. Leblanc was the first to cooperate with him. When the Blériot monoplanes really began to fly, Leblanc definitely joined M. Blériot, as his right-hand man, and became one of the very first Blériot pilots. He took part in the first aviation meeting at Rheims in August, 1909, and won the famous Circuit de l'Est in 1910. In the same year he represented France on a Blériot in the Gordon Bennett Race at Belmont Park, L. I., which was won by Claude Grahame-White. Thereafter he did little flying and became practically the business manager of the Blériot firm.

Great Britain

According to the London *Financial Times* an aviation company is to be formed to establish a route between Ostend, Brussels and London, having secured a substantial government subsidy for this purpose. The organization is practically complete, and includes as manager a man who is the prime mover in aerial navigation and has organized practically all the previously existing air services in England. It is intended to maintain a special daily service between Ostend and London throughout next summer.

Martin Bombers Make Altitude Flights

According to a report by the Chief of the Engineering Division at McCook Field, Dayton, Ohio, a Martin Bomber of the latest model, equipped with superchargers, and with Lieut. Leigh Wade as pilot, made an altitude flight on Dec. 7 to 21,000 ft., with four passengers and no bomb load. The plane was still climbing and could have gone much higher but for the fact that the observer, Roy Langham, was made insensible due to the lack of oxygen.

On the afternoon of Dec. 8 the Martin Bomber, equipped with superchargers, Lieut. Leigh Wade piloting, went to 25,600 ft. and then ran out of gasoline. The pilot switched the gasoline tank to the emergency tank, but the lines were frozen, so he was forced to discontinue the climb. The personnel suffered no inconvenience, having a large supply of oxygen. The bomber was still climbing, and it is estimated that it could go to approximately 28,000 ft.

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